



MISCELLANEOUS PAPER EL-91-5



MACROINVERTEBRATES OF LUXAPALILA CREEK, MISSISSIPPI AND ALABAMA, 1987-89

by

Barry S. Payne, Andrew C. Miller, Christina Miller-Way, C. Rex Bingham
Environmental Laboratory

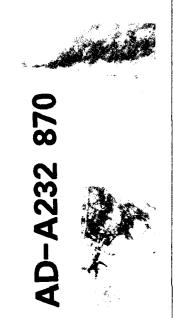
DEPARTMENT OF THE ARMY
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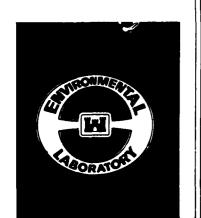




February 1991 Final Report

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Prepared for US Army Engineer District, Mobile Mobile, Alabama 36628-0001

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA. 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AN	D DATES COVERED
	February 1991	Final repor	t
4. TITLE AND SUBTITLE			5. FUNDING NUMBERS
Macroinvertebrates of Lu	xapalila Creek, Mis	ssissippi and	
Alabama, 1987-89			
6. AUTHOR(S)			
Barry S. Payne, Andrew C	. Miller, Christina	n Miller-Way,	
C. Rex Bingham			
7. PERFORMING ORGANIZATION NAME	(S) AND ADDRESS(ES)		8. PERFORMING ORGANIZATION REPORT NUMBER
USAE Waterways Experimen	t Station Environ	mental	
Laboratory, 3909 Halls F			Miscellaneous
MS 39180-6199	erry Road, Vicksbur	٠6,	Paper EL-91-5
9. SPONSORING/MONITORING AGENCY	NAME(S) AND ADDRESS(ES)		10. SPONSORING / MONITORING
J. J. Glegokino, montrollino Adelice.			AGENCY REPORT NUMBER
US Army Engineer Distric	t, Mobile		
Mobile, AL 36628-0001			
11. SUPPLEMENTARY NOTES		<u></u>	
Available from National		on Service, 52	285 Port Royal
Road, Springfield, VA 2	2161		
12a. DISTRIBUTION / AVAILABILITY STAT	'EMENT		12b. DISTRIBUTION CODE
	. 1	11141	
Approved for public rele	ase; distribution u	nrimitea	

13. ABSTRACT (Maximum 200 words)

A survey of the macroinvertebrate community of four pools and four riffles in Luxapalila Creek, Mississippi and Alabama, was conducted in 1987-89. The purpose was to collect preconstruction data before the creek is impacted by selective clearing and snagging, bank protection, construction of notched sills, and a fabric dam. Luxapalila Creek can be characterized as exhibiting high macroinvertebrate species richness, diversity, and equitable distribution of chironomid (midge) larvae and oligochaete (worm) species. These two groups dominated the fauna and comprised 77 and 62 percent of the macroinvertebrates in pools and riffles, respectively. Total macroinvertebrate density was lower although more stable in pools (6,433-7,229 individuals/sq m) than in riffles where it was higher and more variable (9,662-28,820 individuals/sq m). Species richness of chironomids appeared to be greater in pools than riffles probably because of drift out of riffles and into pools. High winter discharge led to greatly reduced macroinvertebrate densities in all riffles and in two pools

			(Continued)
14. SUBJECT TERMS			15. NUMBER OF PAGES
Invertebrates			89
Stream ecology			16. PRICE CODE
,			
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

13. (Concluded).

during the spring of 1989. Post-construction biological monitoring will determine if community composition and total density is affected by proposed channel modifications.

PREFACE

In September 1987, the US Army Engineer Waterways Experiment Station (WES) initiated invertebrate studies on Luxapalila Creek, Mississippi and Alabama, for the US Army Corps of Engineers, Mobile District (CESAM). The purpose was to collect baseline information on invertebrates to evaluate the effects of proposed channel modifications.

This report was prepared by Dr. Barry S. Payne, Dr. Andrew C. Miller, Ms. Christina Miller-Way, and Mr. C. Rex Bingham, all of the Aquatic Habitat Group (AHG), WES. Mr. Edwin Theriot was Chief, AHG, Dr. Conrad J. Kirby was Chief, Environmental Resources Division, and Dr. John Harrison was Chief, Environmental Laboratory, WES, during preparation of this report. Mr. Brian Peck, CESAM, monitored the study and reviewed an early draft of the report. The report was edited by Ms. Janean C. Shirley of the WES Information Products Division, Information Technology Laboratory.

Commander and Director of WES was COL Larry B. Fulton, EN. Technical Director was Dr. Robert W. Whalin.

This report should be cited as follows:

Payne, B. S., Miller, A. C., Miller-Way, C., and Bingham, C. R. 1991. "Macroinvertebrates of Luxapalila Creek, Mississippi and Alabama, 1987-89, "Miscellaneous Paper EL-91-5, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

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CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	Ву	To Obtain
cubic feet per second	0.02831685	cubic metres per second
feet	0.3048	metres
gallons (US liquid)	3.785412	cubic decimetres
inches	2.54	centimetres
miles (US statute)	1.609347	kilometres
square miles	2.589998	square kilometres

MACROINVERTEBRATES OF LUXAPALILA CREEK. MISSISSIPPI AND ALABAMA, 1987-89

PART I: INTRODUCTION

Background

- 1. The US Army Corps of Engineers, Mobile District (CESAM) is preparing a flood control plan for Luxapalila Creek, Mississippi and Alabama. The project area includes the lower reach of the creek, from its mouth to river mile (RM) 25.5. The current plan calls for selective clearing and snagging, bank protection, and construction of notched sills, excavation of pools, and a fabric dam. Proposed channel modifications would protect rural areas upstream of Columbus, MS, against floods expected to occur every 1.5 years, and urban areas within Columbus would be protected against floods expected every 5 years.
- 2. Many aquatic habitats are altered by channel diversion, modification, or construction of dams (Standford and Ward 1979). This demand on lotic habitats has brought about an interest in habitat improvement or development to mitigate losses caused by man's activities. For example, the fabric dam and other modifications proposed for Luxapalila Creek would help to provide access to the upper watershed by walleye for 45 percent of their critical spawning migration period (US Fish and Wildlife Service 1987). A wide array of measures, including construction of sills, artificial riffles, ponds, and planting of riparian vegetation, have been used to improve habitat for aquatic biota in streams throughout the United States (Shields 1983; Woods and Griswold 1981; US Soil Conservation Service 1971a, 1971b; King, Miller, and Glover 1982; Miller 1987.

Purpose and Scope

3. The purpose of this study was to obtain baseline data on sediment characteristics and benthic invertebrates at Luxapalila Creek, Mississippi and Alabama. This information will be used by CESAM to evaluate the effects of proposed channel alterations and mitigation measures on selected reaches of the creek.

PART II: STUDY AREA AND METHODS

Study Area

- 4. Luxapalila Creek is located in northeast Mississippi and northwest Alabama (Figure 1). The creek originates in southern Marion County near Winfield, AL and flows in a southerly and then a southwestern direction for about 75 miles* before joining the Tombigbee River at RM 362.35. The drainage basin includes 794.5 square miles of mainly forested and agricultural land that is relatively unaffected by urban development. Riparian vegetation consists of bald cypress (Taxodium distichum), river birch (Betula nigrum), maples (Acer spp.) and oaks (Quercus spp.).
- 5. The study area included approximately 30 miles of Luxapalila Creek in Lowndes County, Mississippi, and Lamar County, Alabama. In this reach the creek consists of riffles, runs, and short pools. Most pools are narrow, comparatively shallow, and appear to function more like runs than pools. Substrate in the riffles consists of gravelly sand with very little cobble or bedrock. A 26-mile segment of the creek between Winfield, AL and the Alabama-Mississippi State line was channelized in 1922. In 1967 the lower 2.1 miles of Luxapalila Creek was channelized (Arner et al. 1976; US Army Corps of Engineers 1986; US Fish and Wildlife Service 1987).
- 6. Luxapalila Creek is near the northern edge of the Gulf Coastal Plains Physiographic Province. The topography is hilly and ranges from low, smoothly rounded hills of 40-50 ft relief within broad intervening valleys to hills and ridges up to 200 ft high separated by narrow valleys with steeply sloping sides. The basin has a temperate climate characterized by long, warm summers, and short, usually mild winters. The basin receives abundant rainfall that is fairly well distributed throughout the year. Annual rainfall at Columbus from 1951 to 1980 was 56.75 in.
- 7. Four sampling sites, each consisting of a single pool and a nearby riffle, were located on Luxapalila Creek. Sites 1-3 were within the reach to be modified by proposed channel alterations. Site 4, which is in a previously channelized reach, was upstream of proposed channel modifications. The following is a brief description of the four sites surveyed. More detailed data

^{*} A table of factors for converting non-SI to SI (metric) units is presented on page 3.

on sediments and water chemistry at each site can be found in Part III of this report.

Site 1

8. At the site closest to the mouth of the creek (Figure 1) the channel was braided and approximately 80 ft wide. Substrate in the riffle consisted of firm gravel over hardpan clay. There was no submersed vegetation present, although the emergent macrophyte water willow (Justicia americana) had colonized gravelly shoals along the left descending bank.

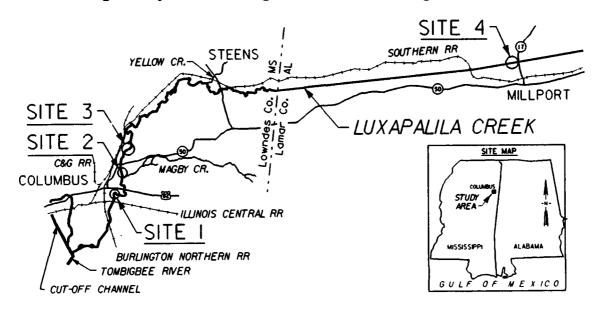


Figure 1. Study sites on Luxapalila Creek, Mississippi and Alabama

9. The pool at site 1 was located approximately 500 ft upriver of the riffle. Approximately 20 percent of the substrate in the lower reach of the pool, where samples were taken, was stabilized by logs or other large snags. Substrate consisted of sand overlain by a 2-in. layer of pea gravel. Canopy coverage was approximately 20 percent and there was no submersed or emergent vegetation in the pool.

Site 2

- 10. The riffle at site 2 was approximately 50 ft wide and was bordered by extensive stands of *J. americana*. The gravel was colonized by scattered clusters of *Sparganium*: sp. covered by an unidentified algae. The riparian canopy was open.
- 11. The pool, which was located approximately 100 ft downstream, was approximately 100 ft wide. Substrate consisted primarily of sand and silt overlain by a layer of leaf litter and twigs. Snags were present in the pool, but to a lesser extent than at site 1. No emergent or submersed vegetation

was observed. The riparian cover, which consisted of *T. distichum* and water oak (*Quercus nigra*), covered approximately 50 percent of the channel. Banks were low, 3-4 ft high, and stable.

Site 3

- 12. The riffle at site 3 was about 50 ft wide, and exposed gravel bars were colonized by J. americana. Substrate consisted mainly of gravel that appeared to be slightly less consolidated than in the riffle at site 2 but more consolidated than gravel at site 1. There were no snags in the channel and no riparian cover.
- 13. The pool was located approximately 1,500 ft downstream of the riffle and 500 ft upstream of a US Geological Survey (USGS) discharge gage (No. 02443500 near Columbus, MS). No submersed vegetation was present and the riparian vegetation did not form a noticeable canopy. *Justicia americana* was present along the border of the pool, but to a lesser extent than in the riffle.

Site 4

- 14. This site, which was located in Alabama, was approximately 20 miles upstream of site 3; this river reach experienced considerably lower average discharge than the lower reach. This reach was straight (the result of channel straightening in the 1920's, Figure 1), less than 50 ft wide, with a nearly closed canopy consisting of oaks (Quercus spp.), maples (Acer spp.), sweetgum (Liquidambar styraciflua), and sycamore (Platanus occidentalis). River banks were 8-10 ft high and many trees along the bank were undercut by erosion.
- 15. Meanders had begun to form within the channelized reach at site 4. The riffle was less than 2 ft deep where samples were taken. There were no exposed gravel bars or emergent vegetation. The pool was located approximately 500 ft downstream of the riffle and had been created by woody snags.

<u>Methods</u>

16. Macroinvertebrates were collected in September, 1987, June and September 1988, and June and October, 1989. Sites 1-3 were sampled from the beginning of the survey through June 1989; site 4 was first sampled in June 1988 and the final sample was taken in October, 1989. Therefore, four consecutive samples were taken at each site; two in the spring and two in the fall. A decision was made by CESAM to add site 4 after the main sampling program had

- begun. Counts of major taxa and species composition for each of the sampling periods are presented in Appendixes A-E.
- 17. At each site, 13 sediment samples were collected from each pool and each riffle. Ten samples were taken for macroinvertebrates, one for total organic content, and two (that were later combined) for grain size analysis. All samples were obtained with a hand-held coring device (Miller and Bingham 1987) that penetrated to a depth of 10 cm and sampled 0.0079 sq m. Organic content was determined by first drying the sample at 65° C, weighing, then heating in a muffle furnace to 550° C. The weight after firing at this latter temperature is termed "ash-free dry weight" and is the loss due to volatilization of organic material. Grain size was determined by sieving the sediments through a standard set of USGS sieves, and weighing each fraction. Sediment samples obtained for macroinvertebrates were preserved in the field with buffered 10-percent Formalin that was stained with rose bengal to facilitate
- 18. In the laboratory benthic invertebrates were removed from sediments by an elutriation process. Sediment samples were agitated (swirled in a 3-gal bucket and poured through a $500-\mu$ mesh sieve. Lighter material (detritus and invertebrates) was poured out of the bucket, sand and gravel remained on the screen, and fine silt passed through the screen. Each sample was elutriated five times; lighter material was combined and sand and gravel were discarded. Tests have indicated that this process retrieves 90-100 percent of the invertebrates on sand and gravel substrate.
- 19. Invertebrates were picked from the elutriated sample with the aid of a binocular microscope. Organisms were first sorted to major group (chironomids, oligochaetes, ephemeropterans, etc.) and counted. Following this initial analysis, chironomids, oligochaetes, and other invertebrates were identified to the lowest possible taxon with appropriate keys. Voucher specimens have been retained at the US Army Engineer Waterways Experiment Station (WES). A complete listing of invertebrates found at each sampling site appears in Appendix A.

PART III: RESULTS

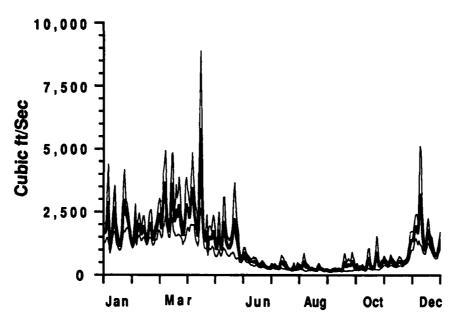
Physicochemical Conditions

Discharge

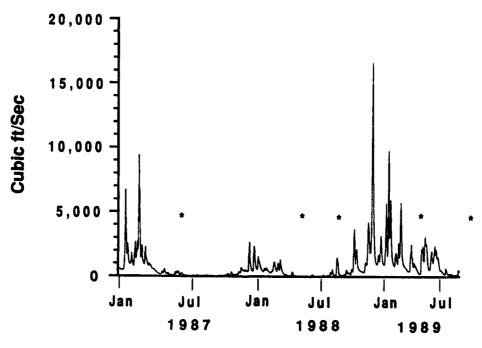
- 20. The mean daily discharge for Luxapalila Creek at Columbus, MS (16 years of record; Tharpe et al. 1987) is 1,130 cfs but varies greatly from winter and spring maxima to summer and fall minima (F. gure 2a). Mean daily discharge was usually greater than 1,000 cfs in winter and spring and often ranged up to 6,000 cfs. During the 16-year period of record the maximum daily discharge was 40,400 cfs on 14 April, 1979. Mean daily discharge was low (< 500 cfs and often 50 to 200 cfs) between June and August; the minimum discharge reported by Tharpe et al. 1987) occurred during the present study and was 20 cfs on 19 August, 1988.
- 21. Mean daily discharge during the winter (1986-87) prior to this study was near average (Figure 2b). Winter and spring discharge in 1987-88 was low; values less than 1,000 cfs were typical and no values greater than 3,000 cfs occurred. In contrast, the winter and spring of 1988-89 were characterized by higher than average daily discharge; during this period a maximum value of nearly 17,000 cfs was recorded (i.e., approximately three times higher than the average maximum value; compare Figures 2a and 2b). The mean daily discharges for dates sampled during this survey are given below:

Sampling Date	Mean, cfs
16 September 1987	102
27 June 1988	40
28 June 1988	37
10 October 1988	216
11 October 1988	177
31 May 1989	239
1 June 1989	217
2 November 1989	194

22. The present study included samples affected by a wide range of hydrologic conditions. The samples collected in the fall of 1987 were taken during a low-water period after a winter and spring characterized by high water. Samples collected in 1988 were taken during a sustained drought after extremely low water during the previous winter and spring. The June 1989 samples were collected after high discharge that occurred during the winter and spring of 1988-89.



a. Average daily discharge ± standard error, 1974-88



b. Average daily discharge during the study period (sampling periods are noted with an asterisk)

Figure 2. Average daily discharge at Luxapalila Creek, Mississippi

Water chemistry

- 23. The water in Luxapalila Creek was moderately low in both calcium hardness (averaging 7 to 8 mg/ ℓ) and alkalinity (averaging 7-10 mg/ ℓ), was slightly acidic, and was clear to moderately turbid (Figures 3a-3d). Dissolved oxygen was high (6.6-8.2 mg/ ℓ) and was always greater than 90-percent air saturation on dates when macroinvertebrate and sediment samples were taken. These aspects of water chemistry are related to land use and soil conditions in the basin. The low hardness and alkalinity reflect moderate to low deposits of limestone. Clear to moderate turbidity is a consequence of lack of heavily farmed agricultural land.
- 24. Community composition and density of benthic invertebrates are primarily affected by substrate composition and water velocity (Hynes 1970). It should be noted that lakes and rivers low in carbonates are generally not as productive (i.e., producing large amounts of biomass per unit of time) as hard-water habitats (Russell-Hunter 1970). Despite their generally lower productivity, soft-water habitats that are relatively unaffected by industrial, agricultural, or residential development (such as Luxapalila Creek) provide valuable habitat for a diverse fauna.

Sediment characteristics

- 25. The substrate of Luxapalila Creek can be characterized as poorly sorted gravel and coarse sand (Figures 4a and 4b). At all sites the silt-clay fraction (< 0.02 mm), and cobble fraction (< 100 mm) each constituted less than 5 percent of the total sediment weight. Median grain sizes for all samples ranged from 4.11 to 18.13 mm; sorting coefficients ranged from 0.90 to 2.72. Pools typically had slightly smaller median particle diameters than did riffles (7.79, ±2.32 (± standard deviation (SD)) versus 10.23 ±4.56, respectively). However, these differences are nonsignificant and should not obscure the fact that with respect to substrate characteristics pools and riffles in Luxapalila Creek are relatively similar. Differences between pools and riffles were affected by season. During the summer when discharge events capable of redistributing gravel became less frequent, differences between pools and riffles became even less apparent.
- 26. The average substrate organic content at all sites and habitat types was low and equaled 1.18 percent (\pm 0.89). There was no significant difference in percentage organic carbon between pools (1.05, \pm 0.41) and riffles (1.31, \pm 1.19). In addition, there were no significant differences among stations (pools and riffles combined) for all dates. Average organic content

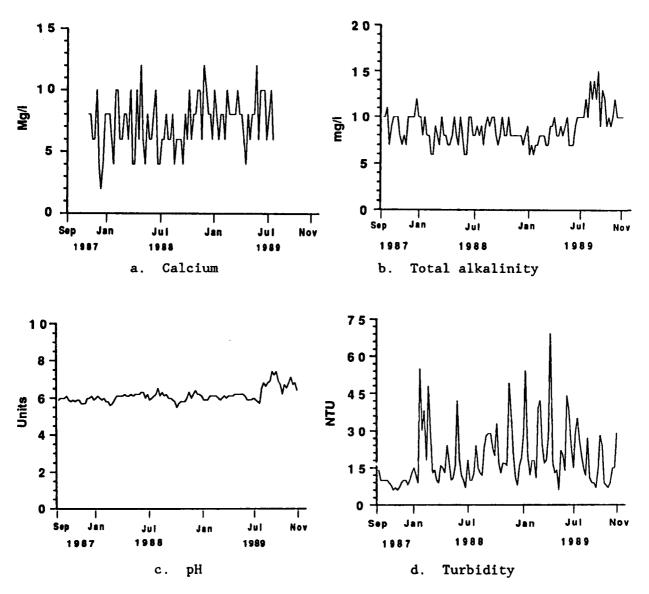
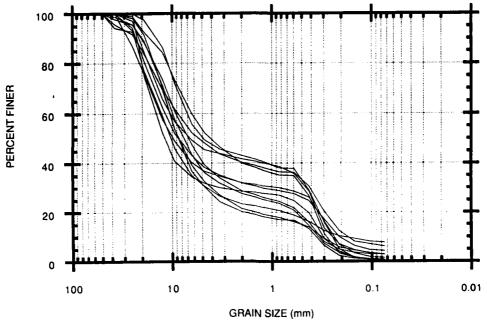


Figure 3. Five-day averages for selected water quality parameters at Columbus, Luxapalila Creek, Mississippi.

Data courtesy of the Columbus Water Department



a. Pools

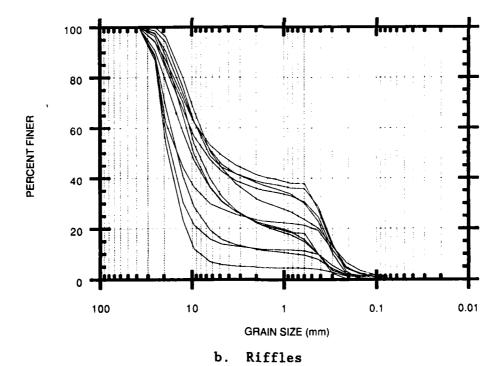


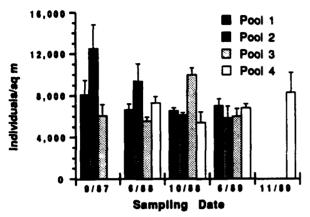
Figure 4. Sediment characteristics in pools and riffles in Luxapalila Creek, Mississippi and Alabama during the study period

for all dates was 1.2 (\pm 0.63), 1.1 (\pm 0.47), 0.93, (\pm 0.33), and 0.88 (\pm 0.41) for sites 1, 2, 3, and 4, respectively. There was no significant difference in organic content with respect to season, although organic contents of sediments were slightly less during the spring (0.91, \pm 0.45) than in the fall (1.5 \leq (1.5, \pm 1.15).

Biological Conditions

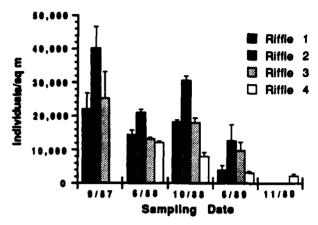
Macroinvertebrate density

- 27. The density of macroinvertebrates, averaged for all pools and dates, equaled 7,364 individuals per sq m. Variation in average macroinvertebrate density in pools was not great among sites or dates (Figure 5a). The lowest average density was observed at pool 4 in October 1988 and equaled 5,427 individuals per sq m; the highest average density of 12,561 individuals per sq m was observed at pool 2 in September 1987. Neither spatial nor seasonal density patterns were evident among sites and dates. The ratio of the total range of variation in average density (7,134 individuals per sq m) to the overall average density (7,364 individuals per sq m) equaled 1.0. This low value indicated lack of extreme variation in macroinvertebrate density data among pools and sampling dates.
- 28. In contrast to pools, average macroinvertebrate density in riffles varied greatly among sites and dates (Figure 5b). Averaged for all sites and dates, macroinvertebrate density in riffles equaled 15,964 individuals per sq m and was slightly greater than twice the overall average density in pools. At sites 1, 2, and 3 (sampled from fall 1987 through spring 1989), average density appeared to follow a seasonal pattern. At each of these sites, the average density in spring was substantially less than in the preceding fall. At site 4, the average density of macroinvertebrates declined between spring 1988 and fall 1989; however, density at this site declined between October 1988 and June 1989 as was observed at the other three riffles. Site- and date-specific average densities in riffles varied from 2,184 (riffle 4, November 1989) to 40,276 (riffle 2, September 1987) individuals per sq m. The ratio of this range (38,092 individuals per sq m) to the overall average density (15,964 individuals per sq m) equaled 2.4, indicating greater than twice as much variation in total macroinvertebrates in riffles than in pools.

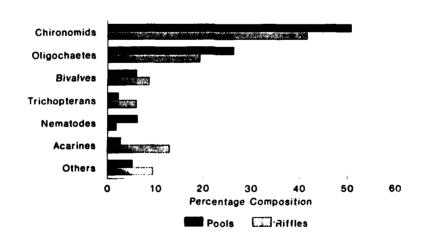


a. Density $(\bar{x} \pm SE)$ of all macroinvertebrates in pools

lux1



b. Density (x ± SE) of all macroinvertebrates in riffles



c. Percentage composition of major macroinvertebrates in pools and riffles

Figure 5. Characteristics of macroinvertebrates in Luxapalila Creek, Mississippi and Alabama, 1987-89

29. A summary of mean macroinvertebrate density (and standard error, SE) by sampling date and habitat type, appears below:

	Pools		Rif	<u>fles</u>
Date	Mean	SE	<u>Mean</u>	SE
Sep 87	8,587	4,426	28,820	20,469
Jun 88	7,229	2,421	15,248	3,985
Oct 88	7,025	2,221	18,730	8,553
Jun 89	6,433	1,701	9,662	12,614

The greater stability of biological conditions in pools than riffles is indicated by the more consistent mean and mean-to-SE ratio of macroinvertebrate density in the former habitat.

- 30. Analysis of variance of total macroinvertebrate density was performed for spring and fall 1988 and spring 1989 samples (i.e., those dates when all four pools and riffles were sampled). Significant variation in total macroinvertebrate density was evident among sites in both the spring and fall of 1988 (Table 1). Paired comparisons of sites confirmed the intersite patterns in Figures 5a and 5b; namely, density was higher in riffles than pools, intersite variation among riffles was high, and intersite variation among pools was low (Table 2). In both the spring and fall of 1988, 17 of 28 possible pairwise combinations between sites revealed significant differences. In the spring of 1988, 14 of these significant differences were for poolversus-riffle comparisons, and all such comparisons indicated lower densities in pools than riffles. The remaining differences observed in spring involved inter-riffle comparisons, with densities at riffle 2 being significantly greater than densities at the other three riffles. In the fall, 12 of the 17 significant differences among sites involved riffle-versus-pool comparisons, and, as in the spring, riffles always had higher densities than did pools. The remaining five significantly different pair comparisons involved intersite differences among riffles. Riffle 4 had significantly lower macroinvertebrate density than all three other riffles, and riffle 2 had higher density than riffles 1 and 3. No significant intersite differences among pools were evident in either the spring or fall of 1988.
- 31. Lack of significant intersite differences (i.e., among pool, pool versus riffle, or among riffle) in total macroinvertebrate densities in the spring of 1989 (Table 1) was principally the result of the reduction in density in riffles during that sampling period (Figure 5b). These low densities in riffles in the spring of 1989 eliminated pool-versus-riffle differences

Table 1

Analysis of Variance of Total Macroinvertebrate Density at all Sites
in Luxapalila Creek, Spring and Fall, 1988 and Spring, 1989

Date	Source	DF	Sum Squares	<u>Mean Square</u>	F	p
Spring	Between sites	7	53,180	7,597	29.1	0.0001
1988	Within sites	32	8,346	261		
	Total	39	61,526			
Fall	Between sites	7	167,338	23,905	89.0	0.0001
1988	Within sites	32	8,592	269		
	Total	39	175,930			
Spring	Between sites	7	58,217	8,317	1.93	0.097*
1989	Within sites	32	137,881	4,309		
	Total	39	196,098	·		

^{*} Not significant at the 0.05 level.

that were evident in 1988. Furthermore, within-riffle density in the spring of 1989 was high and obscured the between-riffle differences that were evident in the spring of 1989.

- 32. Chironomids and oligochaetes were the numerically dominant macroinvertebrates in both pools and riffles (Figure 5c). These two taxa comprised an average of 77 and 62 percent of all macroinvertebrates in Luxapalila Creek pools and riffles, respectively. Corbicula fluminea, trichopterans (caddisflies), acarines (mites), and nematodes (unsegmented worms) were less abundant than chironomids and oligochaetes but also comprised a substantial proportion of the total macroinvertebrate community. The bivalve community was dominated by the introduced Asiatic clam, Corbicula fluminea. Dominant trichopterans were Hydroptila and Chimarra. Bivalves, trichopterans, and acarines were more abundant in riffles than pools, but nematodes were more abundant in pools than riffles. Corbicula, Hydroptila, and Chimarra typically are found in lotic habitats. Neither acarines nor nematodes were identified to a lower taxonomic level.
- 33. The average density of chironomids, the dominant major taxon, was less variable in pools (Figure 6a) than in riffles (Figure 6b). Maximum density of this group was higher and minimum density was lower in riffles than pools. Averaged for all sites and dates, chironomid density in pools and riffles was 3,981 and 7,419 individuals per sq m, respectively. Site- and

Table 2

Paired Comparisons of Site-Specific Density of Total Macroinvertebrates

in Luxapalila Creek, Spring and Fall 1988

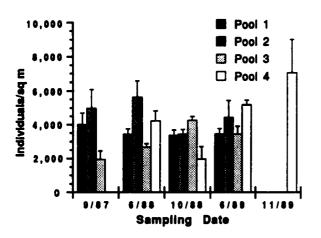
		Spring	1988	Fall	L988
		Mean	Scheffe's	Mean	Scheffe's
		<u>Difference*</u>	<u>F-test</u>	<u>Difference*</u>	<u>F-test</u>
	Pl vs P2	-15.4	0.325	3.2	0.014
	Pl vs P3	8.4	0.097	-27.0	0.970
Interpool	Pl vs P4	-5.8	0.046	8.8	0.103
comparisons	P2 vs P3	23.8	0.776	-30.2	1.213
•	P2 vs P4	9.6	0.126	5.6	0.042
	P3 vs P4	-14.2	0.276	35.8	1.705
	Pl vs Rl	-62.0	5.264**	-92.0	11.258**
	P1 vs R2	-106.8	15.620**	-188.8	47.413**
	P1 vs R3	-51.2	3.590**	-90.4	10.870**
	Pl vs R4	-47.0	3.025**	-11.4	0.173
	P2 vs R1	-46.6	2.974**	-95.2	12.055**
	P2 vs R2	-91.4	11.440**	-192.0	49.034**
	P2 vs R3	-35.8	1.755	-93.6	11.653**
Pool-to-	P2 vs R4	-31.6	1.367	-14.6	0.284
riffle	P3 vs R1	-70.4	6.787**	-65.0	5.620**
comparisons	P3 vs R2	-115.2	18.174**	-161.8	34.822**
-	P3 vs R3	-59.6	4.864**	-63.4	5.347**
	P3 vs R4	-55.4	4.203**	15.6	0.324
	P4 vs R1	-56.2	4.325**	-100.8	13.515*
	P4 vs R2	-101.0	13.969**	-197.6	51.936**
	P4 vs R3	-45.4	2.823	-99.2	13.089**
	P4 vs R4	-41.2	2.324**	-20.2	0.543
	R1 vs R2	-44.8	2.748**	-96.8	12.464×*
	R1 vs R3	10.8	0.160	1.6	0.003
Inter-riffle	R1 vs R4	15.0	0.308	80.6	8.641**
comparisons	R2 vs R3	55.6	4.233**	98.4	12.879**
-	R2 vs R4	59.8	4.897**	177.4	41.861**
	R3 vs R4	4.2	0.024	79.0	8.301**

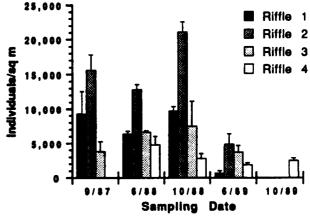
^{*} Negative values indicate lower mean density at first site listed for each paired comparison.

^{**} Probability of F < 0.05.

date-specific average density ranged from 1,953 to 7,036 individuals per sq m in pools and from 709 to 21,139 individuals per sq m in riffles. The ratios of these ranges to the overall average densities in pools and riffles were 1.3 and 2.9, respectively. In pools, variation of chironomid density did not follow a discernible intersite or seasonal pattern. In riffles, chironomid density was generally lowest in riffle 4 and highest in riffle 2. The seasonal pattern for total macroinvertebrates of lower density in spring than in the preceding fall was evident for chironomids in riffles 1 and 2. Riffle 1 was especially depauperate of chironomids in June 1989 compared to the three previous dates, and all four riffles had relatively low chironomid densities in June 1989.

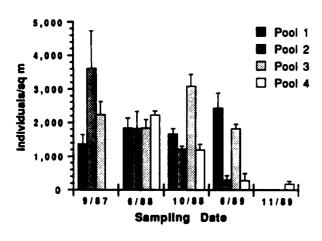
- 34. The average density of oligochaetes was similar in pools and riffles and varied greatly among sites and dates (Figures 6c and 6d). Averaged for all sites and dates, the densities of oligochaetes in pools and riffles were 1,697 and 2,861 individuals per sq m, respectively. Site- and date-specific average densities of oligochaetes ranged from 178 to 3,620 and from 51 to 9,709 individuals per sq m in pools and riffles, respectively. Exceptionally low densities were observed during June 1989 (pools 2 and 4 and riffle 4) and in November 1989 in both the pool and riffle of site 4 (the only site samples in November 1989).
- 35. Corbicula fluminea, which was moderately abundant in riffles, had especially low densities at all riffles in June 1989 (Figure 7). Less than 500 individuals per sq m were found at riffle 1 in the spring of 1989, although densities of this clam had averaged 2,000 individuals per sq m during 1988. In riffles 2 and 3, 1988 densities of C. fluminea averaged 1,000 and 2,750 individuals per sq m, respectively, but no Asiatic clams were collected from these two riffles in June 1989. No C. fluminea were found in riffle 4 in June 1989, although high density populations were never noted at this site. Community composition
- 36. In Luxapalila Creek the abundant chironomid and oligochaete communities were rich in species. In both pools and riffles, cumulative species of chironomids and oligochaetes was a linear function of the cumulative number of individuals (Figures 8a and 8b). The rate of acquisition of new species was clearly higher in pools than riffles. In pools, 63 species of chironomids were represented among 1,503 individuals identified to the species level. In riffles, 50 species of chironomids were represented among 1,910 individuals.

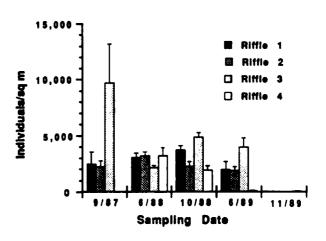




a. Chironomids in pools

b. Chironomids in riffles





c. Oligochaetes in pools

d. Oligochaetes in riffles

Figure 6. Total density of chironomids and oligochaetes in pools and riffles, Luxapalila Creek, Mississippi and Alabama, 1987-89

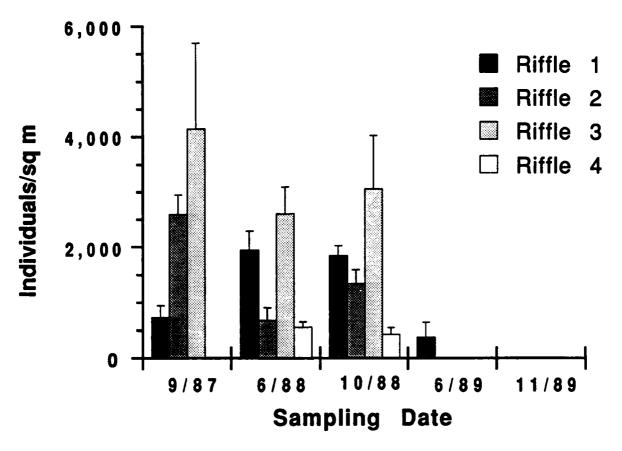
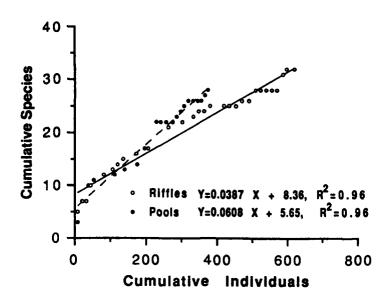


Figure 7. Total density of *Corbicula fluminea* in riffles in Luxapalila Creek, Mississippi and Alabama, 1987-89

37. The distribution of individuals among species of both chironomids and oligochaetes was highly equitable (i.e., evenly distributed) based on Simpson's index of equitability (Simpson 1949), and equitability was slightly higher in pools than riffles (Tables 3 and 4 for chironomids and oligochaetes, respectively). The value of this index equals one minus the sum of the proportional abundance of each species in a community. The index is relatively insensitive to underestimation of species richness and ranges from theoretical minima and maxima approaching 0.0 and 1.0, respectively. Values between 0.2 and 0.8 are observed in most samples of naturally occurring communities (e.g., Whittaker 1965). Simpson's index of equitability was slightly less than 1.0 for both taxonomic groups in both habitats (Tables 3 and 4 for chironomids and oligochaetes, respectively). The theoretical maximum equitability of chironomids in pools would have been observed if there was equal distribution of the 1,503 individuals among all 63 species identified from pool samples (Simpson's



a. Naidids and tubificids

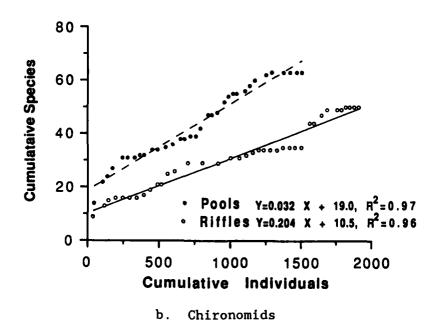


Figure 8. Species richness as a function of cumulative individuals for oligochaetes and chironomids, Luxapalila Creek, Mississippi and Alabama, 1987-89

Table 3

<u>Distribution of Individuals Among Species of Chironomids</u>

<u>in Luxapalila Creek, Mississippi*</u>

	Poo	ls	Riffles	
Species	<u>p</u>	<u> </u>	p	<u>n</u>
Chironomidae				
Chironominae				
Chironomini				
Chironomus sp.	0.0160	24	0.0005	1
Cladopelma sp.	0.0013	2	0.0000	C
Cryptochironomus fulvus	0.0213	32	0.0011	2
Cryptochironomus sp.	0.0027	4	0.0011	2
Dicrotendipes neomodestus	0.0140	21	0.0661	124
Dicrotendipes nervosus Type I	0.0319	48	0.0016	3
Dicrotendipes nervosus Type II	0.0013	2	0.0000	(
Dicrotendipes sp. I	0.0120	18	0.0080	15
Endochironomus sp.	0.0093	14	0.0005	1
Glyptotendipes sp.	0.0033	5	0.0005	1
Harnischia sp.	0.0040	6	0.0005	1
Microtendipes sp.	0.0007	1	0.0000	(
Nilothauma babiyi	0.0106	16	0.0016	3
Parachironomus abortivus	0.0020	3	0.0005	1
Paracladopelma undine	0.1240	186	0.0016	3
Paralauterborniella nigrohalteralis	0.0313	47	0.0016	3
Paratendipes albimanus	0.0013	2	0.0000	(
Paratendipes nudisquama	0.0007	1	0.0000	(
Phaenopsectra dyari	0.0838	126	0.0000	(
Phaenopsectra flavipes	0.0186	28	0.0000	(
Polypedilum convictum	0.0067	10	0.0762	143
Polypedilum fallax	0.0013	2	0.0000	(
Polypedilum illinoense	0.0126	19	0.0053	10
Polypedilum nr. scaloneum	0.1190	179	0.0410	77
Pseudochironomus sp.	0.0146	22	0.0016	3
Robackia sp.	0.0033	5	0.0624	117
Stenochironomus sp.	0.0007	1	0.0000	(
Stictochironomus sp.	0.0020	3	0.0005	1
Tribelos sp.	0.0000	0	0.0005	1
Xenochironomus sp.	0.0053	8	0.0213	40
Unidentified chironomini	0,000	4		
Tanytarsini		·		
Cladotanytarsus sp.	0.0146	22	0.0320	10
Lauterborniella sp.	0.0013	2	0.0000	-(
Micropsectra sp.	0.0033	5	0.0000	ò
Rheotanytarsus sp.	0.0140	21	0.0736	138
Stempellina sp.	0.0013	2	0.0000	
(Contin		_		

^{*} Note: p - relative abundance; n - number present.

Table 3 (Concluded)

	Poo	ols	Riffles	
Species	<u>D</u>	<u> </u>	<u>P</u>	<u>n</u>
Stempellinella sp.	0.0020	3	0.0000	
Tanytarsus coffmani	0.0000	0	0.0016	
Tanytarsus glabrescens	0.0319	48	0.0474	8
Tanytarsus querlus	0.1530	230	0.0245	4
Unidentified tanytarsini		0		
Orthocladiinae				
Brillia sp.	0.0007	1	0.0000	
Coryoneura celeripes	0.0013	2	0.0144	:
Coryoneura taris	0.0013	2	0.0197	:
Coryoneura sp.	0.0007	1	0.0016	
Cricotopus bicinctus	0.0120	18	0.0938	1
Cricotopus trifascia	0.0000	0	0.0011	
Cricotopus sp.	0.0013	2	0.0016	
Eukiefferiella sp.	0.0027	4	0.0032	
Nanocladius crassicornus	0.0027	4	0.0037	
Nanocladius distinctus	0.0027	4	0.0059	
Nanocladius rectinervis	0.0000	0	0.0027	
Nanocladius minimus	0.0013	2	0.0000	
Nanocladius sp.	0.0067	10	0.0006	
Parakiefferiella sp.	0.0619	93	0.0448	
Rheocricotopus sp.	0.0000	0	0.0053	
Thienemanniella nr. fusca	0.0047	7	0.2569	4
Thienemanniella xena	0.0007	1	0.0219	
Unidentified orthocladiinae		5		
anypodinae				
Ablabesymia mallochi	0.0033	5	0.0011	
Ablabesymia parajanta	0.0446	67	0.0139	
Ablabesymia tarella	0.0020	3	0.0016	
Clinotanypus sp.	0.0007	1	0.0000	
Labrundinia pilosella	0.0007	1	0.0059	
Macropelopia sp.	0.0013	2	0.0005	
Natarsia sp.	0.0013	2	0.0005	
<i>Nilotanypus</i> sp.	0.0007	1	0.0219	
Pentaneura sp.	0.0067	10	0.0000	
Procladius sp.	0.0599	90	0.0021	
Thienemannimyia sp.	0.0013	2	0.0005	
Unidentified tanypodinae		34		
Diamesinae				
Potthasia sp.	0.0007	1	0.0000	
Unidentified Chironomidae		67		
Total number of species		63		
Total number of individuals ident	tified	1,504		1,8
Simpson's index of equitability		0.93		0.9

Table 4

<u>Distribution of Individuals Among Species of Naidid and Tubificid Oligochaetes</u>

<u>in Pool Versus Riffles in Luxapalila Creek, Mississippi*</u>

	I	Pools	<u>Ri</u>	ffles
Taxon	<u>n</u>	D	<u>n</u>	D
Naididae				
Amphichaeta leydigi	6	0.0160	1	0.001
Bratislavia bilongata	0	0.0000	2	0.003
Bratislavia unidenta	0	0.0000	4	0.006
Chaetogaster diaphanus	3	0.0080	51	0.083
Dero digitata	3	0.0080	10	0.016
Dero furcata	13	0.0347	0	0.000
Dero nivea	8	0.0213	78	0.1270
Dero obtusa	11	0.0293	76	0.123
Dero trifida	3	0.0080	9	0.014
Dero sp.	5	0.0133	3	0.004
Homochaeta naidina	1	0.0027	0	0.000
Nais behningi	0	0.0000	3	0.004
Nais bretscheri	0	0.0000	3	0.004
Nais communis	0	0.0000	3	0.004
Nais elinquis	ĺ	0.0027	Ō	0.000
Nais pardalis	12	0.0320	90	0.146
Nais pseudobtusa	0	0.0000	10	0.016
Nais simplex	0	0.0000	3	0.004
Nais variablis	2	0.0053	53	0.086
Piquetiella michiganensis	5	0.0133	29	0.047
Pristina aquiseta	4	0.0107	28	0.0456
Pristina leidyi	6	0.0160	33	0.053
Pristina synclites	29	0.0773	1	0.001
Pristina sp.	0	0.0000	ī	0.001
Pristinella jenkinae	2	0.0053	ī	0.001
Pristinella longidentata	3	0.0080	2	0.0033
Pristinella longisoma	0	0.0000	9	0.0147
Pristinella osborni	8	0.0000	52	0.0147
Pristinella sima	0	0.0000	2	0.004
Slavina appendiculata	2	0.0053	21	0.003
Specaria josinae	52	0.0033	1	0.0016
Stevensoniana trivandrama	1	0.1387	26	0.0010
Stevensoniana tiivanutama	ī	0.0027	20	0.0423
Total identified naidids	180	0.4800	602	0.980
Total unidentified naidids	0		8	
Total naidids	180		610	
Cubificidae				
Aulodrilus limnobius	19	0.0507	0	0.000
Aulodrilus piqueti	127	0.3387	4	0.0065
F-1mon	(Continued)	0.0007	•	2.2240

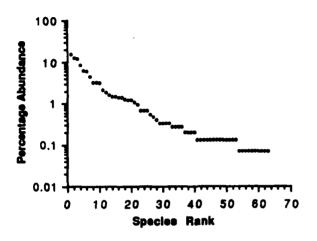
^{*} Note: n = number present; p = relative abundance.

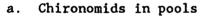
Table 4 (Concluded)

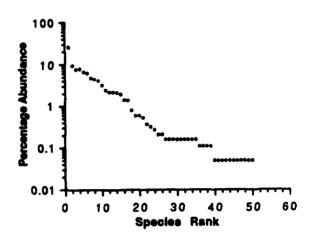
	Pools		Riffles	
Taxon	<u>n</u>	p	_n_	<u>D</u>
Aulodrilus pluriseta	6	0.0160	0	0.0000
Branchiura sowerby	31	0.0827	7	0.0114
Limnodrilus hoffmestri	11	0.0293	0	0.0000
Limnodrilus rubripenis	0	0.0000	1	0.0016
Total identified tubificids	195	0.5200	12	0.0195
Total unidentified tubificids	78		28	
Total tubificids	275		40	
Tubificid-to-Naidid Ratio	1.53		0.07	
Simpson's Index of Equitability	0.84		0.91	

index value equal to 0.98). In contrast, the most inequitable possible distribution would have been observed if there was a single individual of each of 62 species and 1,441 individuals of one extremely dominant species (Simpson's index equal to 0.08). The observed value of 0.92 is near the theoretical maximum of 0.98. Similarly high values were observed for chironomids in riffles and oligochaetes in both pools and riffles.

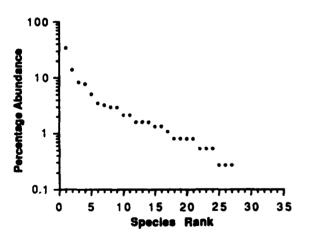
- 38. The unusually high equitability of chironomids and oligochaetes in pools and riffles was especially evident in plots of species-specific percentage abundance as a function of species rank (Figures 9a-9d). It is not unusual for the two or three most abundant species in a community of benthic macroinvertebrates to comprise 75-90 percent of the entire community. In Luxapalila Creek, no individual species comprised greater than 30 percent and the three most abundant species represented approximately 50 percent of the total community. Species relative abundance in these highly equitable communities spanned only 2.0 to 2.5 orders of magnitude in each community sample, although total species richness was high, ranging from 27-63.
- 39. Distinct differences were apparent in the most abundant species of chironomids in pools versus riffles, although at least a few individuals of most species could be found in either habitat type (Table 3). None of the six most abundant species in pools were among the six most abundant species in riffles. The six dominant chironomids in pools were Tanytarsus querlus (15.3 percent), Paracladopelma undine (12.4 percent), Polypedilum nr. scalaenum (11 percent) Phaenopsectra dyari (8.4 percent), Parakiefferiella sp. (6.2 percent), and Procladius (6.0 percent). All but one of these species (P. dyari) were obtained in riffles as well as pools, although both P. undine and Procladius sp. were very uncommon in riffles. Tanytarsus querlus, P. nr. scalaenum, and Parakiefferiella sp. were moderately abundant in riffles; these species comprised 2.5, 4.1, and 4.5 percent, respectively, of the chironomids in riffles. Considered in total, the six most abundant species in pools comprised 60.2 percent of the pool assemblage of chironomids, versus 11.5 percent of the riffle assemblage of chironomids.
- 40. The six most abundant species of chironomids in riffles were Thienemanniella nr. fusca (25.7 percent), Cricotopus bicinctus (9.4 percent), Polypedilum convictum (7.6 percent), Rheotanytarsus sp. (7.4 percent), Dicrotendipes neomodestus (6.6 percent), and Robackia sp. (6.2 percent). The combined abundance of these six species in riffles and pools was 62.9 and 6.3 percent, respectively. None of the dominant species in riffles was found



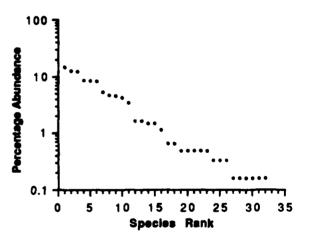




b. Chironomids in riffles



c. Naidids and tubificids in pools



Naidids and tubificids in riffles

Figure 9. Species relative abundance in relation to dominance for chironomids and oligochaetes in pools and riffles, Luxapalila Creek, Mississippi and Alabama, 1987-89

in greater than 1.6 percent abundance among pool-dwelling chironomids, although some individuals of all six species were obtained from the more lentic habitat.

- 41. Differences were also evident between pool and riffle chironomid communities among uncommon species. Eighteen uncommon species of chironomids were found in pools but not in riffles, but only four such species were found only in the riffles (Table 3). Community structure in terms of uncommon species must be evaluated cautiously, because a high degree of uncertainty is associated with presence or absence data for uncommon species. Nonetheless, the magnitude of pool-versus-riffle difference in the number of species unique to each habitat type (i.e., a ratio of 18 to 4) indicates that more species of this group probably occurred in pools than in riffles. Drift of chironomid larvae is a major means of dispersal in rivers and streams (Simpson and Bode 1980). Settlement of drifting larvae in pools is probably more likely than in riffles given the more depositional nature of the former habitat. Thus regardless of the origin of drifting chironomids, successful immigration via drift into pools is probably higher than into riffles and may account for the slightly greater richness observed in pools versus riffles.
- 42. As with chironomids, the pool community of oligochaetes was dominated by different species than the riffle community (Table 4). The six most abundant species in pools included three tubificids (Aulodrilus piqueti (33.9 percent), Branchiura sowerbyi (8.3 percent), and A. limnobius (3.5 percent)) and three naidids (Specaria josinae (13.9 percent), Pristina synclites (7.7 percent), and Dero furcata (3.5 percent)). Two of these species (A. limnobius and D. furcata) were not obtained in riffles, and the other four dominant species in pools were uncommon in riffles. The combined abundance of these six species was 72.4 percent in pools and only 2.2 percent in riffles. The six most abundant species in riffles were all naidids, and included Nais pardalis (14.7 percent), Dero nivea (12.7 percent), D. obtusa (12.4 percent), N. variables (8.6 percent), Pristinella osborni (8.5 percent), and Chaetogaster diaphanus (8.3 percent). All six of these species were also obtained from pools, four occurred in pools in moderate abundance (2.0 percent), but none individually comprised more than 3.2 percent of the oligochaete community in the more lentic habitat type. The combined abundance of these six species was 65.2 percent in riffles and 11.6 percent in pools.
- 43. As reflected in the species composition of dominant oligochaetes in pools and riffles, the pool community was a mixed assemblage of tubificids and

naidids, but the riffle community was almost entirely comprised of naidids (Table 4). Tubificids are lentic species, collected frequently in ponds and lakes, whereas naidids are found in riffles. The ratio of tubificids to naidids equaled 1.52 and 0.07 in pools and riffles, respectively. Among uncommon species, this inter-habitat difference was also notable. Ten species of naidids were obtained from riffles but not pools, whereas three species of naidids were found in pools but not riffles. Three species of tubificids were found in pools but not riffles, and only one species of tubificid (Limnodrilus rubripenis) was found only in riffles.

- 44. The particular combination of species occurring at a given site (especially on a particular date) was generally consistent with, but not identical to, the pool or riffle communities indicated by the composite data summarized in Table 5. Intersite comparisons of chironomid and oligochaete species composition were made using Jaccard's similarity index of beta diversity. Beta diversity is essentially a measure of how different sites are in terms of the variety of species found in them (Magurran 1988). Jaccard's index of beta diversity is equal to j/(a+b-j); where <u>a</u> and <u>b</u> equal the number of species in sites \underline{a} and \underline{b} , respectively, and \underline{i} equals the number of species found in both sites. Intersite similarity was low, as exemplified by comparisons among sites in the fall of 1987 (Table 5). The highest observed value was only 0.65 for chironomids at the site 2 riffle versus the site 3. results indicate that species composition varies among pools and riffles, although the degree of dissimilarity is probably overestimated due to the low abundance of most species (Figures 9a-9d) and the uncertainty of even the presence or absence of such species based on anything less than extremely extensive sampling.
- 45. Community composition at the species level also varied greatly among sampling dates. For example, although *Nais pardalis* was the most abundant oligochaete in riffles based on all data combined, this species did not occur in the fall 1988, the spring 1989, or the fall 1989 samples.
- 46. Only by combining data for all pools and all riffles for all sampling dates are characteristic interhabitat differences evident (Table 5). For example, rheophilic (flow-loving) chironomids that dominated the combined data set for riffles (Thienemanniella nr. fusca, Cricotopus bicinctus, Polypedilum convictum, and Rheotanytarsus sp. as shown in Table 3 did not occur in the same relative abundance on each riffle on a particular date or in similar abundance in a particular riffle on different dates. In addition, although

Table 5

Community Comparisons (Jaccard's Index) for Chironomids and
Oligochaetes in Luxapalila Creek, Mississippi, 1987-89

Taxonomic Group	<u> Habitat</u>	Comparison Between Sites			
		1 vs 2	2 vs 3	1 vs 3	
Chironomidae	Pool	0.55	0.63	0.41	
	Riffle	0.59	0.65	0.61	
Oligochaeta	Pool	0.31	0.23	0.43	
	Riffle	0.35	0.35	0.36	

naidids generally dominated the oligochaete community in riffles, species composition of this group exhibited great variation among sites and dates. In general, dynamic changes in species composition even among dominants were generally so great that they masked seasonal patterns of density change that were evident at the family level of description.

- 47. In June 1988, 20 specimens of the oligochaete Piquetiella michiganensis were found in four of five samples of the riffle at site 4. Densities were estimated at 314.3 (\pm 258.2) individuals/sq m. In a nearby pool two of five core samples yielded one specimen each with an estimated density of 31.4 (\pm 38.5) individuals per sq m. Similar sampling at two pools and two riffles in Luxapalila Creek near its confluence with the Tombigbee River yielded no P. michiganensis. In the fall of 1988, a single P. michiganensis was collected in a riffle in the upper section of the lower reach.
- 48. This species has been reported in north central North America as far south as Virginia (Brinkhurst 1986). It has been collected in the Great Lakes and upper Mississippi River east to the Susquehanna and Chemung Rivers in New York (Hiltunen and Klemm 1980; Klemm 1985), and south to the Wabash River in southern Indiana.* More complete macroinvertebrate surveys in the central United States would establish whether the apparent disjunct distribution of this species is the result of incomplete data or specific habitat requirements that are occasionally met at the periphery of its range.

^{*} Personal Communication, Feb 1989, Dr. Michael S. Loden, Jefferson Parish Environmental Department, Jefferson, LA.

PART IV: DISCUSSION

Major Findings

- 49. In this macroinvertebrate study in Luxapalila Creek, samples were taken after exceptionally high (June and November 1989) and low (June and September 1988) water. Floods and droughts are physical factors of potentially major significance to the structure and abundance of stream invertebrate communities. Intersite and interdate variability in community structure were probably intensified by the extreme range of physical conditions that occurred during this study. This factor was mainly responsible for the high biological diversity in Luxapalila Creek. In addition, the high equitability of species within chironomid and oligochaete communities reflected effects of a wide range of extreme physical conditions that occurred between September 1987 and November 1989.
- 50. Especially low densities of chironomids, oligochaetes, and total invertebrates were prominent characteristics of Luxapalila Creek in June 1989, although each site did not exhibit reduced density of all three groups. It is noteworthy that the highest mean daily discharge (14,000 cfs) recorded during the course of this study occurred in January 1989. The prominence of especially low densities in June 1989 is evidence that scouring floods affected standing crops (although to different degrees for particular taxa at particular sites). By November 1989, oligochaetes at site 4 (the only site sampled in the fall of 1989) had not recovered in the pool or riffle, but chironomids in pool 4 were at the highest average density observed for this group of invertebrates in Luxapalila Creek pools (Figure 6a). Midges are notable for their ability to rapidly recolonize after decimation, with their aerial adult stage and the aquatic drift of larvae contributing to this opportunistic characteristic (e.g., Simpson and Bode 1980). Oligochaetes are of course fully aquatic; naidids can enter the drift although tubificids rarely do (Milbrink 1973). During early biological colonization of a manmade gravel bar in the Tennessee-Tombigbee Waterway, chironomids were among the first colonists while oligochaetes appeared later (Bingham and Miller 1989).
- 51. In addition to scouring high flows during the winter and spring of 1989, this study included a period of sustained and exceptionally low water during the summer and fall of 1988. The lowest recorded discharge (25 cfs) in the 16-year history of records was measured during the summer of 1988. The

abundance of Paracladopelma undine, a dominant chironomid in pools, declined greatly in the fall of 1988, from initially high densities in the fall of 1987 and spring of 1988. Paracladopelma undine is a member of a genus that is apparently restricted to cool water (Wierderholm 1983). It is possible that the decline of this species in the fall of 1988 may have been related to physical stress (such as reduced dissolved oxygen and increased water temperature) associated with extremely low stream discharge for a sustained period. Similarly, it is noteworthy that the highest measured ratio (5.0) of tubificid to naidid oligochaetes on any date was measured for the October 1988 pool samples. Tubificids are recognized to be tolerant of pool water quality, including low dissolved oxygen and high temperature (Brinkhurst and Cook 1974).

- 52. Ordinarily, cumulative species is a linear function of the logarithm of the cumulative number of individuals (e.g., McNaughton and Wolf 1973). The lack of a semilogarithmic relationship between cumulative species and cumulative individuals (Figure 8) during this study was primarily because even more species of chironomids and oligochaetes are likely to occur in Luxapalila Creek than were identified. Nonetheless, the extreme physical conditions of both low and high flow allowed more species per individuals identified to be accounted for than if more stable discharge conditions had prevailed.
- 53. The slopes of dominance-diversity plots of chironomid and oligochaete communities (Figures 9a-9d) were extraordinarily low and indicate the high equitability of species in Luxapalila Creek. Percentage abundance of species changed only two orders of magnitude in community samples of 27-63 species. Generally, a range in species abundance of 3 to 5 orders of magnitude would be associated with rich assemblages of species (McNaughton and Wolf 1973; Whittaker 1965). In comparison, species abundances of 15-30 species in samples of riverine mussel communities typically span the same range as that observed among 27-63 species of chironomids or oligochaetes in Luxapalila Creek. The high equitability among species of chironomids and oligochaetes in Luxapalila Creek pools and riffles observed during the present study may have been enhanced by the extreme range of hydraulic conditions.

Recommendations

54. Choice of sites within the project area for a post-construction macroinvertebrate study should include at least one pool-riffle sequence not directly affected and one pool-riffle sequence directly affected by the project. Pools directly affected by construction may become more depositional in nature than pools not directly affected by construction. Thus, poolversus-riffle comparisons at locations directly affected by the project may show clearer differences in macroinvertebrate community structure than poolversus-riffle comparisons at locations not directly affected by the project. As in the present study, characterizations of the macroinvertebrate community should focus on density and species relative abundance. Macroinvertebrates should be studied at the pool and riffles of site 4, because this site is upstream of the project area and is not likely to show direct or indirect effects of project construction.

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APPENDIX A
COUNTS OF MAJOR TAXA PER CORE SAMPLE, FALL 1987

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PLATYHELMINTHES						-					
TURBELLARIA			-								
	Dugesia tigrina		-					-	1		
	Planaria sp.	+	+					-	1		
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	Unidentified naididae										
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	Aulodrilus piqueti	9	1	~	=	7	7	22	13		16
	Branchiura sowerbyi				2	=	-	80	-		-
	Limnodrilus hoffmeisteri										
	Potemothris vejdovskyi			Ì							-
	Unidentified tubificidae	2	-				2		<u>~</u>		~
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	Bidessus sp.									-
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	Helipus sp.						-			-
COLLEMBOLA	hydrochus sp.						+			
	Isotomurus palustris	-								
DIPTERA	Sminthurides sp.						+			
CHIRONOMID							+	-		
	Chironominae									
	Chironomus sp.							2		
	Cryptochironomus fulvus		-	2		'n	-	9		
	Dicrotendipes neomodestus	7	-	~	-	2	1			
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	Parachironomus abortivus	2								
	Paracladopelma undine	7	2 17	2	2	2	9	10	11	6
	Paralauterborniella sp.	-	-				1			
	Polypedium convictum	-	-		1		1	2	1	
	Polybeditum nr. scaloenum	7	2				-		7	•
	Pseudochironomus sp.	9					-		-	3
	Robackia sp.		-				-			
	Stenochironomus sp.									
	Xenochironomus sp.				-			7		1
	Unidentified chironomini						-			
	Tanytarsini									
	Cledotanytersus sp.	2	3		9			2		5
	Micropsectra sp.		-				+	~		
	Kneotanytarsus sp.									
	Stempetiting sp.						1			
	Tanylarsus diabrescens	-	2	-			+		ſ	-
	Tenytersus querius	4				7	2	7	9 4	7
	Orthocladinae									2
	Corymoneura celeripes	2								
	Cricotopus bicinctus				-		3			-
	Manual adding presentations	-					1	1		
	Namocladius distinctus						1			
	Nanocladius rectinervis						-			
	Nanocladius sp.	-								
	Parakiefferiella sp.	9	9	2	2	7	2	80	12	2
	Rheocricotopus sp.						-	-		
	Thienemenniella nr. fusca						-			
	Thienemenniella xena									
	Unknown sp.						1	_		•
	Tanypodinae					-	+			Ī
	Ablabesayia tarella	3				-		\dagger	Ì	
	Labrundinia pilosetta						+			
				1	1	1	1	1	1]

TAKA	GENUS SPECIES	P\1\3 P\	P/11/7 P	P\1\8	01/1/9 9/1/10	0 P\2\3	P\2\6	P\2\8	P\2\9 P\2\10	9
	Macropelopia sp.	2								
	Nilotanypus sp.	• • • •		 - -	-	-	-			
	Pentaneura sp.			 			-			
	Proctadius sp.		_			m	-	7		~
	Unidentified tanypodinae	2		-	-	~		2		
	Unidentified		_		_	_	-	9		٥
	Ceratopogonidae			į						П
	Alluaudomyim sp.	-	-	3	2	3		-		
	Bezzie sp.			7	-	+	-	7	-	m
	Empididae		-	+	-	-	+	-		T
	Hemerodromia		+	+		+	+	+		T
EPHENCY EXA	Casale	+	+	+			!		1	T
	Ephemerelle so.	1	-	· ·	-			-	-	Τ
	Tricorythodes sp.			_	-	-				Γ
	Cinygmula subsequalis			-						
	Spinedis wellece									
	Unknown sp. A (squatty bodies)									
	Unknown sp. 8 (slim guys)									
	Unknown sp. C									
COONATA										
	Argie sp.		-	1					-	
	Macromia sp.		-	_				-		
	Archilestes		-	4						Ì
	Immatures		-				-			\exists
PLECOPTERA			_	+					-	
	Perlinella ephyre	 								
	Immatures		-	-						
TRICHOPTERA			-	+			+	+		T
	Macronema zebratum	-	+	+			1			
	Unknown hydropsychid sp.		+	1						
	Mydroptile sp.		-	-						T
	Oecetis sp.	-	-	-			-			
	Chimerra sp.		-	_	-			*	_	
	Polycentropus sp.		-				-			~
	Lype diversa		-			- +				+
	Unidentified	-	+			!				Ţ
AMPHIPODA		-		-	-			1	1	T
•	Symurelle sp.		+			-	+	+	-	T
	Assilus so			!		;	+			Τ
ACARINA		2	_	7		1	-	=		-
MOLLUSCA		:								
PELECYPODA	Corbicula fluminea	2	2	-	-	Ē	ç	28	17	7
GASTROPODA	Ferrissia rivularis	~					-		-	-
	Amnicola sp.		-		-	!				Ī
	Gyraulus sp.		-		-					
	Unidentified	:::	+	-		-				
OTHER		- 1	-	-		-	-	Ī	-	6
MEMEDIEA		07	0	+		3	7	•	•	^
	Prostoma graecense	+ !	-		3					П
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TOTALS		26	89	2	69	30 53	88	145	38	5
SPECIES NUMBER		12	23	=			22	32	1	5

Second S	(Luxabalila Creek, Mississippi		-		-			-	-	-		
Controller Con	Sampling Date: 9/16/87			++		 				+		
The state The	4244	ACIA SE CHEP I CO	Ш		0.2.4	1		Ш			1 h	Ш
Degret 1977 1 2 1 1 1 2 1 1 1 1	PLATYHELMINTHES	ucinos sretires	١.	Į_	0.52			L	2			L
Objects Express Content Cont	TURBELLARIA			†-			-	-	-	-		
							-	2		-		
COMMETA CONTINUED CONTIN		Plenerie sp.		1	-	+	+	+	-		-	ľ
CONTINE CONT	ANNEL IDA	Data Charles				+	-	•	-	+		
Spergatophilus Sper	POLYCHAETA								-			
Expression Exp	OL I GOCHAETA											
Imprint title Mark title		Sperganophilus			+	-	-	+	+	+	-	
Marcial Land Linguistic Marcial Linguistic Ma		Lumbriculidae	-				9	35	2	+		2
Markitavia bi logatea Earkitavia bi logatea												
Descriptive unindentate Descriptive unin			+		1	-	-	+		+		
Detail of giglate a claphanus 2 2 2 2 3 4 4 4 4 4 4 4 4 4						+		-	+	+		
Dero digitate Dero digitate Dero diffide 1 2.5 1 1 4 1 1 Dero private							- 2					,
Deco futness		Dero digitata	3		- -	-		+	+	+		
Der Obtivities Der		Dero furcata			+	5.5	-	+	+	17		
Note December Note Not		Dero obtusa				2.5	+	+	+	+	-	
Mais becascheri Mais becascheri Mais percentaria Mais percentaria Mais percentaria Mais percentaria Mais variabits Mais variabits Mais variabits Mais variabits Pristina larby Pristina la		Dero trifida			-							
Nais Dectacher Nais Dectacher Nais Dectacher Nais Dectacher Nais Communis Nais Communis Nais Communis Nais Communis Nais Pecucioticus Nais variablis Nais		Nais behningi						-		1		
Mais perdelis Mais virtibilis Mais virti		Neis bretscheri	-			+		+	+	+		
Nais pseudoctusa Nais variabilis 2 2 2 2 2 2 2 2 2		Nais Cardal is			~	2	J				60	71
Pristine a variablis		Nais pseudobtusa	•			-	-					
Pristina quisca 1 1 1 1 1 1 1 1 1		Nais variablis			~							
Pristing SynCites Pristing SynCites Pristing SynCites Pristing Lead Institute Lead SynCites Pristing Lead SynCites Pristing Lead Short Prist		Pristing equiseta				-		+	+			<u> </u>
Pristine(la jenkinae) Pristine(la la jenkinae) Pristine(la la longidentata) 2 1 2 3 3 3 4 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4 4 1 2 4 1 4 1 4 1 4		Pristing synclites		2	<u>.</u>	1	-		+			<u> </u> -
Pristinetle longidentate Pristinetle longidentate Pristinetla tongisoma Pristinetla tongisoma Pristinetla singentate osborni Pristinetla singentate Pristinet		Pristine(ta jenkinae									1	Ц
Pristinctia subgissing 1 2 1 2 2 2 2 2 2 2					+			a		1	-	
Stavine appendicutata Stavine appendicutata Stavine appendicutata Stavine appendicutata Stavine appendicutata Stavine appendicutata Stavine			-	-		1		2	+	2	-	
Stavine appendicutata 1 1 2 3		Pristinella sima										
Stevensonians trivandrona		Slavine appendiculata	+	+	= -	-			1			-
Unidentified naididae Unidentified naididae Tubificidee Tubificidee Autodritus Diqueti 2 5 2 2 2 2 2 2 2 2		Stevensoniana trivandrama	+	-	-	-	-	7	+	1		
Tubificidea		Unidentified naididae				-						
Autodritus limobius		ı										
Autocritus piqueti		- 1		1	-		-		+	$\frac{1}{1}$		
Limmodrillus hofferly 1 1 2 3 6 2 2 4 1 2 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 4 4 4 4 4 4 4 4				200	•		+		+	+		
Potemothris vejdovskyi		Limnodrilus hoffmeisteri	-		-		-					
Unidentified tubificidae		Potamothris vejdovskyi										
Welchdella elongata Welchdella elongata Unidentified 0 6 16		Unidentified tubificidae	-	1 2	2	9	-	7	+	+		
Unidentified 16	HIRIDINEA	Unidentified Helphaelia elonosta		+	+	,	_	7	$\frac{\downarrow}{\downarrow}$	+		
9 9		Unidentified				-	-	-	+	+	-	
	AEDLOSOMATIDAE			 	+		+	80	9	16	2	

608.0	CEMIC COEFIEC	51813 51316 51815	01318 p13110	01111	81112 81113	P1114 2111A	81213	17/2/8
AT CRACK			1		l_	L	L	
TOP TERM				•				
	Bidessus so.			:				
	Stene ais sp.] .]		-		
	Helipus sp.				-			
	Hydrochus sp.			-	2			
COLLEMBOLA				-				
	1sotomurus pelustris		-	-1	1		~	
DIDIEDA	Sminthurides sp.			•				
CHIRONOMID				-				
	Chironominae			_				
	Chironomus sp.		9					
	Cryptochironomus fulvus							
	Dicrotendipes neomodestus	2	3	1		1 7.7	15.5	6.8
	Dicrotendipes nervosus		• • • • • • • • • • • • • • • • • • • •					
	Dicrotendipes sp. 1			1				
	Endoch I conomus sp.					-		
	Wilderma Daniyi		+	+		+	1	
	On the section of the section of	1 0 0		+				
	Paralauterbornielle so.		•	:		:		
	Polypedilum convictum		:		9	2.6	5 28.9	69
			· ·	:	2		l	
	Polypedilum nr. scaloenum							
	Robackie sp.				,			
	Stenochironomus sp.		•	- 10				T
		*		5.2	121	51.6	9:9	
	Unidentified chironomini	+	-					
	Tanytarsini		-	1		-	,	
	Cladotanytarsus sp.		+	- 3.4			•	
	Micropsectra sp.			3 02	, ,	-	:	
	Kneotenytarsus sp.			, i			+	
	Stemper Line Sp.			-				
	Tanytarsus glabrescens			-	7	18.1	6.7	10.4
	Tanytarsus querlus			-				
	Orthocladiinae							
	Corynomeura celeripes			" i•	2			
	Cricotopus bicinctus	2	-	5.2	2	55.5	?	
	Manoriadire crass corner			-		+		Ī
	Nanocladius distinctus			 				
	Nanocladius rectinervis							
	Nanocladius sp.							•
	Parakiefferiella sp.			9.0	0	-		0.0
	Thisperiotopus sp.			- 0	4	2 7 7	200	200
	This management is the control of th		-1	23.6				
	Unknown sp.	*						
	Tanypodinae							
	Ablebesmy is perejants					2.0		
	Ablabesmy1a tarella	1	-	- 6	17	•		T
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ואאל	GENCS SPECIES	1/5/4	P/3/6 P/3//	P\3\8	P\5\10	K/1/1	R/1/2 R	R/1/5 R	R/1/6	R/1/8 R/	R\2\3	1/2/2
	Macropelopia sp.				•		-	+	-	- - -	-	-
	Nilotanypus sp.			-	-	21	9		-	5.2		
	Pentaneura sp.			-								
	Proctadius sp.]- -			-						
	Unidentified tanypodinae			-	-				_			3.5
	Unidentified			-	-	ဆ		2				
	Ceratopogonidae								_	_		
	Allueudomyia sp.											
	Bezzia sp.		-	2	m	-						3.5
	Empididee				-			_		_		
	Hemerodromia				-	-	-	-	-	-	4	
EPHEMEROPTERA				-		+	+	-	+	-	$\frac{1}{1}$	
		-	+	-					1	1	1	
	Ephemerella sp.				1		+	-	+	+	-	ľ
	Tricorythodes sp.						+				2	2
	Cinygmule subsequalis	_	-	1	-		+	+	-			
	Spinadis wallace	-	1			-	+	-	 - 	+	+	
	< €			-			-	-	-	+	=	
	Unknown sp. 6 (stim guys)			+		-		1	+	1	+	Ī
COCHATA	2	:		1			-	-	+	+	+	
	Aroia so.		-	+	1				-	-		Ī
	Macromia so.			-			ļ 	-			-	
	Architestes	-					-				-	
	Immatures					-	! -			-	<u> </u>	ĺ
PLECOPTERA		•			-	•					-	
	Perlinella ephyre		•				-			_		
	Immetures	•			· · · · · · · · · · · · · · · · · · ·	- i		-			+	
TRICHOPTERA				-	-	- 1			1		-	
	Macronema zebratum		-		-	-				2	+	
			1			- }	-	-	-	+	-	ľ
	Hydroptite sp.		1		-	-	+	3	3	1	9	9
	Oecetis sp.	-				-		-	-	-	~	~
					-	8	32	2	~	-	3	7
	Polycentropus sp.					-				-	_	
	Lype diversa	-			-			4	_	_	_	
	Unidentified			_		-	-	_	1		~	
AMPHIPOOA					-			-		$\frac{1}{1}$		
	Synurella sp.					-	+	-	-	-	-	
SOPOR			-	-	-		+	+	1	+	$\frac{1}{1}$	Ī
ACABINA	Aserica sp.	-	-	7		45	87	202	12	1.6	40	07
MOLUSCA				-	-	1	?	+	-	-	3	
PELECYPODA	Corbicule flumines		2	1-	-	7	-	2	=	•	12	22
GASTROPODA			3	-			-	-		-	13	2
	Amricola sp.							-				
	Gyraulus sp.		3			:					-	-
	Unidentified	•		!	-;		-	-	+		+	:
OTHER		:,			•		+	•	+		,	•
NEWATODA		•	10 10	7,7	· · · · · ·	.		-	+	3	7	1
אַנענע - בע	Prostone greecense					1	+	+	+	-	~	
		-					-					Γ
TOTALS		23	85 79	87	82	267.2	232	111		189	\$22	8
SPECIES NUMBER		12			12	92	56	20	16		22	22

Sampling Date: 9/16/87	16/87				:		-			 										
Cambe of major taxe.		_	L							i						1			_	
	107	-		-	! -		+				-		+			-			1	
(10 those samples identified to species	rified to	species	counts.	S are s	Lamed he	ere. all	others	(*)	e rak da	data)	. .	- - -	 							
			4 - ف										+ +							
MAJOR TAXA R	81111 81112	2 811/3	3 8/1/6	6 81118	8 81213	R\2\6	R1216	8/2/8	R12/9	R\2\10	R/3/1	R\3\2*	R1313	R/3/6	8/3/5	R\3\6*	13/7	13164	#1319#	R\5\10
-	ட	1.	L			ı			Ī-		-	-								
Turbellaria	-	9	-	_	0		- 	-	7	0	12		14	0	14	7	2		7	0
Oligochaeta	15		9	9				17	16	9	97	72	320	76	69	22	75	32	95	37
Chironomidae	131 77	7 24		129		5.		154	109	142	15	38	51	87	122	2	12	~	7	7
Ceratopogonid	0	0	0	0			 	0	0	0	0		0	0	0			-		
Coleoptera	-	~			i			_	0	0	0		0	0	-1	-				
Ephemeroptera	0	-	_					Ξ	32	4	0	<u></u>	•	2	2		-			
Odonate	0	0	0	0				-	0	0	-		-1 !	~	-					
Plecoptera	0	0	-	0				0	0	0	0	_	2	0	2					0
Trichoptera	89	35 20	10					15	21	20	80	2	7	11	7		3	-	•	
Amph i poda	0	0	0	0				0		0	0		0	0	0					0
Isopoda	0	0	0	0				0	0	0	0		0	0	0					٥
Bivelvia	3		5 11	8			٥	22	23	2	39	35	132	55	11	7	7	2	15	22
Gastropoda	0	0		0		ļ [13	35	15	3	æ	0	2	80				1)
													1							
MINOR GROUPS											!	+ ; !								
Acerina	38 4	68 39	9 13	3 17			27	10%	220	152	~	9	8	2	2	•	15	5	13	~
Polychaeta	0	0	0	0			. !		0	-1	0	- + 	0	0	0					
Hirudinea		0	0	0	0	0		0	0	0	-	-	0	0	٥					
Empididae	0	0	0	0		Ì				a	0		0	0	٥					
Collembola	5	1	2 (0				0	0	0	0	i	0	0	0			-	2	0
Nematoda	7	0	1	0	2				=		٣	2	7	ຂ	٥	~	2	-	2	-
Nemertea	0		0	0	2	ĺ		-	0	~	-	7	٥	0	7	2	7		2	•
Aeolosomatidae	0	80	9	16	0	ļ	0	٥	2	0	9		88	77	21	1				
TOTAL	636 736	111	1	180	275	8	135	153	067	385	176	185	809	285	202	23	28	75	70	8
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Sampling Date: 9/16/87					-					
Raw species data: LX987RAU										
TAKA	SEMIC COEFFE	9,2,4	01218 O	01710 01710	- 12.0	21210	7,2,4	100	A1 40	
PLATYHELMINTHES		L	l	1		L	L		2	
TURBELLARIA										
	Dugesia tigrina	-		-	8	9		2		
	Plenarie sp.									
	Unidentified		-	3	7			3		
ANNELIDA								Í		
POLYCHAETA			+							
OLIGOCHAETA				1						
	Spargenophicus				-					
	naprotaxidae		+							
	Apirical contract		+		7					
	Anchichaeta Levdigi		-						1	
	Bratislavia bilongata			2					-	
	Bratislavia unindentata		_	_			7			
	Chaetogaster diaphanus	3	7	12	3		2	12.5	2	
	Dero digitata					10.7	1.9		3.3	
	Dero furcata									
	Dero nivea				18			12.5	1.7	
	Dero obtuse				-2	10.7			6.7	
	Dero trifida	1	+				3.7		23	
	Nais behningi		-					6.		
	Nais Dretscheri	+	+				-	3.5		
	Nais compais		-	+	2				1	
	Neis pardalis	2	80		- -	44.5	^	30.2	1	
	wats pseudootusa		1		- 0	70.0		2	+	
	Mais Variables	•					7			
	Pristing adulseta	,	- -		-	3 //				
	Drietine confiden	+	•		2	44.3	0	?		
	Printing Sylverices								1	
	Pristinella longidentata				-				-	
	Pristinella longisoma									
	Pristinella osborni					53.4			2	
	Pristinella sima									
	Stavina appendiculata				7	7.92 7	9	3.5		
	Specaria josinae									
	Stevensoniana trivandrama		+	1		8.9	2			
	Unidentified naididae		+				2	Ì		
	Autodrilus I (mobius		+	+					1	
	Autodritus piqueti			-				 	-	
	Branchiura souerbyi		-	-				Ť	-	
	Limodrilus hoffmeisteri		-	-					T	
	Potemothris veidovskyi		-							
	Unidentified tubificidae	2			2		-			
	Unidentified	-		2	7	8.9				
HIRUDINEA	Melobdella elongata							1	1	
3741.47700.00.7	Unidentified				-			1	1	
ACULUSONAL LUAE			^	2		۸۰۰۸	33	रः	1	

Particle		PENSIS COEPICE	91519 316	0,0,0	710 0110	112 10	112 10 11	91710	01 21 40	
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Sindexis Sp.	COLEOPTERA					-				I
Steelleist 9P 1 1 1 1 1 1 1 1 1		deserie co		+	-	 -				
International State	300			+		-				
Isotranura patientis Santauris Santaurides Sp.	16	erice in 15 sp.					1	<u> </u>	+	
Introduction Chiromous applications		it ibus sp.		+				1		
Stocomurus palustris Sainthurides sp. Sainthurides sp. Chironomia fulvus Chironomia fulvus Chironomia fulvus Chironomia fulvus Chironomia fulvus Chironomia sp. Chironomia sp		drochus sp.		1		1		-		
Sintifucing put Sint Control S			+	+		-			+	
Chitchonia Chi	Ø	otomurus palustris			-	-				
Chi Counting		intinurides sp.		\dagger	-		+			
Disconniese Chiconniese					-	-			-	
6 21.6 8.7 36.2 4.1 2 6 21.6 8.7 36.2 4.1 2 7 2.8 4.1 1 1		ironominae	+				-		-	
6 21.6 8.7 36.2 4.1 2 2 2.8 10.9 16.8 11 4.1 1 2 33.8 10.9 16.8 11 4.1 1 2 5 2.2 2.2 2 6.2 13.1 11.1 4.1 1 2 6.2 2.2 2.8 4 111 4.1 1 2 6.2 2.2 2.8 4 111 1 2 6.2 2.2 2.8 4 111 1 3 33.4 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10		Chironomus sp.		-						
6 21.6 8.7 36.2 2 2 2.8 2.8 10.9 16.8 11 2 9.2 2 2 2.0 6.2 13.1 11.1 4.1 11.1 4.1 11.1 4.1 11.1 11		Cryptochironomus fulvus		-	2.8	7	-			
2 2.2 2 9.2 2 1.6 8.7 5.5 2 1.6 8.7 5.5 2 1.6 8.7 7 2.8 4 3.1 11.1 4.11 4.1 11.1 4.11 4.1 11.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1		Dicrotendipes neomodestus		8.7	36.2					
2 2 2 8 8 7 5.5 8 6.1 10.0 10.8 11.1 11.1 11.1 11.1 11.1 11		Dicrotendipes nervosus				-				
2 2.2 2 9.2 2 9.2 2 9.2 2 12.2 2		Dicrotendipes sp. 1								
2 2.2		Endochironomus sp.				-				
2.2 2.2 2.2 2.2 3.1 4.3 4.1 13.9 4.1 11.1 4.1 13.9 2.2 2.2 2.3 3.1 3.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4		Nilothauma babiyi			2.8	-				
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135 353 490 385 141									•
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28 28 70 75 70 28 28	SPECIES NUMBER		24 32	1				31	61

APPENDIX B

SPECIES COMPOSITION IN BENTHIC SAMPLES COLLECTED IN THE SPRING OF 1988

Septicing Date to 6/26-27/1908 Septicing Date to 6/26-27/1908	00 10 10 1		-	_		_		_		_	_	_	_		_	_		_		_	_
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TAXA	GEMIS SPECIES	P\2\2	P\2\4	P\2\6	P\2\8	P\2\10	9\4\6	P\4 7	81714	61914
PLATYHELMINTHES										
IORSELLAKIA	O. Contraction of the Contractio		-		1				•	
	Planeria So.		-		-	-			7	
	Unidentified			-						
ANNEL IDA										
POLYCHAETA										
OL I GOCHAETA		-	-	+	1					
	Sparganophilus				-					
	Heplotexidae		-	+	1	1		1		
	Lunoriculdae				+			F		
	Amphichaeta lecdini		-	+	+					
	Bretiel axis hi (xxxxts		+	+	\dagger					
	Bretislevia unindentata			+						
	Chaetogaster diaphanus			-						
	Dero digitata				-					
	Dero furcata									
	Dero nivea								2	
	Dero obtusa				-		-			-
	Dero trifida			-						
	Nomochaeta naidina							-		
	Nais behningi			1						
	Nois Dretscher:									
	NB18 CORMUNIS			-	+					
	Nais perdelis	-	-							
	Mais pseudoorusa	+	-	+	+		1			
	Mais Variabils		1		+					
	Piquetietta michiganesis	+		1	1	†				
	Pristina aquiseta			+		=				
	Pristing leidyl			+				-		
	Deleginal Syncines							-		
	-1-		-					-		
	1			-						3
	Pristinella sima									
	Stavine appendiculate		-							
	Specaria josinae	2	£	2	7	~		7	3	
	Stevensoniana trivandrama			-						
	Unidentified naididae		+		-					
	Tubificidae	+		-		+	1			
	Autodritus timpoblus	-		+	-	-	- •	3	1	
	Autodritus pluciesta	-		+	-	•	•		-	
	Branchiura sowerby:	-	-	-			-			
	Limnodrilus hoffmeisteri						7			
	Potemothris vejdovskyi									
	Unidentified tubificidae		3	2	-	•	1	•		E
	Unidentified			. 		=	-	<u> </u>		~

TAKA	GENUS SPECIES	P1212	P1214	61216	PVZVR	512110	91710	21914	8/4/9	01710
		-	_	-	-	-		-		
HIRUDINEA	Helobdella elongata		<u>-</u>	-	1					
	Unidentified									
AEOLOSOMATIDAE										•
ARTHROPODA						1				
INSECTA						1				
						-				
	Stenelmin no				-					
	Helipus sp.	-		-		-	-	-		
	Hydrochus sp.									
COLLEMBOLA										
	Isotomurus palustris			_						
	Sminthurides sp.		-		1					
CHIBONOMID										
al Poroxity	Chironominae				-					
	Chironaus sp.			-			3	2	-	5
	Cryptochironomus fulvus	3	3	2	2	m				
	Dicrotendipes neomodestus									-
	Dicrotendipes nervosus	-	2	٣						
	Dicrotendipes sp. 1		-	-	7		-			-
	Endochironomus sp.	+		-	-	•	3	-		
		-			- -	=				
	Harnischie sp.				+	+			1	
	Denschipponese abortions								=	
	Paracladorelma undine	9	80	•		21	*	6	ec.	1,
	Paralauterborniella sp.				+				8	!
	Paratendipes albimanus						-			
	Phaenopsectra dyair	-								-
	Polypedilum convictum				-	2		-	-	
	Polypedilum illinoense									
	Polypedilum nr. scaloenum		-	7	7	3	2	1	3	1
	Pseudochironomus sp.			2	-	=				
	Robackie sp.			+					1	
	Stictochironomus so.			-			-			
	Xenoch i ronamus sp.									
	Unidentified chironomini									
	Tanytarsini									
	Cladotanytarsus sp.									
	Photentaria sp.									-
	Stempel ing sp.				-	+				
	Stempellinella sp									
	Tanytarsus glabrescens	2	\$	1	2	2		1		2
	Tanytarsus querlus	2	5	=	2	m	2	80	12	7
	Orthocladiinae	+		-	1	1	+	1		
	Corynoneura celeripes		+	-		+				
	Cricotopus bicinetus		 			+				
	Eukiefferiella sp.									
	Manocladius crassicornus									
	Menocladius distinctus									
										1

		2 :0 : 5			1					
SAKA	GENUS SPECIES	2/2/4	2/2/4	0/2/4	8\7\4	P\2\10	0/9/4	119/4	5/9/4	2
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	Namocradius sp.		-		-	- -	1	+		
	Parakiefferiel (a Sp.		/	0	7	7		-		
	Rheocricotopus sp.			-			1			
	Thienemanniella nr. fusca		-		-					
	Thienemanniella xena									
	Unknown sp.			-	-					
	Tanypodinae				-		-			
	Ablabesmyia parajanta		=	_	7	-				
	Ablabesmyia tarella		-		-	-				
	Labrundinia pilosella									
	Macropelopia sp.									
						ļ 				
	Pentaneura sp.									
	Procladius sp.	9	-	-	3	80	7	7	2	9
	Unidentified tanypodinae				2		9		2	
	Unidentified	2		2	3	3	2			2
\ L										
	Alluaudomyia sp.			-		2				
	Bezzia sp.					2	-			-
S.F.	Empididae									
	Hemerodromia									
EPHEMEROPTERA				-						
	Caenis sp.									
	Ephemerella sp.						_			
	Tricorythodes sp.									
	Cinygmula subaequalis									
	Spinadis wallace									
	Unknown sp. A (squatty bodies)									
	Unknown sp. B (slim guys)		-					-		
	Unknown sp. C									
COONATA										
	Argie sp.						-			
	Macromia sp.									
	Archilestes								-	
	Immetures						-			
PLECOPTERA		-								
	Perlinella ephyre									
	Immetures	=				_		-	-	
TRICHOPTERA										
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	Unknown liyal obsychild sp.	-		•				•	•	
	mydroptile sp.	+		,	-		1	+	-	
	Oecetis sp.		+	+			+			
	Chimarra sp.			-				-		-
	Polycentropus sp.						-			
	Lype diversa									
	Unidentified		-			-				Ī
AMPHIPODA							-			
	Synurelle sp.						1			
1 SOPODA							-	+		
	Asellus sp.	- 4		+			-			
ACARINA			-	-	7	-5	_			~

	GENIS SPECIES	P\2\2	P\2\4	9/2/9	P\2\8	P\2\10	9/9/4	2/9/4	8/9/6	0/4/0
			-	-					_	
POLLUSCA										
CYPOOA	Corbicula fluminea	2	7	13	7	9		2		1
	Ferrissia rivularis	ı	1			-				1
	Amicole sp.									
9	Gyraulus sp.									
3	Unidentified									
OTHER							_			
NEMATODA			5	m	~	4	2	-	-	2
NEMERTEA										
	Prostoma graecense		_							
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N.2\(\)	R.212 R.213 R.214 R.125 R.314 R.132* R.1316* R.1316* R.145 R.1418 R.141	(for those samples identified to species, counts are summed
1		
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TAKA	GENUS SPECIES	P\4\10	R12\1	R\2\2	R\2\3	81214	R\2\5	R\4\5	R1417	8/6/8	R1419	R\-110
HIRUDINEA	Nelobdella elongata	+			- -	-			†		-	
	Unidentified		-	+	. -	-	-					
AEOL OSOMAT I DAE			10		2	-	2	7				
ARTHROPODA												
INSECTA					-							
COLEOPTERA				+		1			-+-		+	
	Bloesus sp.			-	-		-	1			\dagger	
	Halipus sp.		-	-	-	-		T	=			
	Hydrochus sp.											
COLLEMBOLA												
	Isotomurus palustris	-	-				+	-	1			7
PIDIEBA	Sminthurides sp.		+							-	+	T
CHIROMONIO							-		1			
	Chironominae		-									
	Chironomus sp.	-	-									
	Cryptochironomus fulvus											
	Dicrotendipes neomodestus		=	-	15	7	~		2	2		
	Dicrotendipes nervosus											
	Dicrotendipes sp. 1	2	0	2	2	4	-			-		
	Endochironomus sp.	7	1			-						
	Glyptotendipes		-				-					
	Harnischie sp.		-						1			1
	Nilothauma babiyi				+	-	+	1	1		2	
	Parachironomus abortivus	- 6	-	•	+							
	Paraciacopera undire	0		-	-		+	1			1	
	Paratendines albimanus	-		!	-	-	+					
	Phaenonaectra dvair	-			-							
	Potvoedi (un convictum		2	2	-		7	77	9	9		7
	Polypedilum illinoense		-			1	1			•		
	Polypedilum nr. scaloenum	9			-	 	-		2	9	2	
	Pseudochironomus sp.					-	-					
	Robackia sp.							2		-	~	7
	Stenochironomus sp.											
	Stictochironomus sp.					-	-					
	l'		-					1				
	Unidentified chironomini	-	+	1						+		
	Ienytersini	+	1			•	+	1	†	+	†	1
	Cladotamytarsus sp.		= -			3			•	•	*	2
	Photogramme sp.		,		 -	+	^	4		 	4	1
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	Stempellinella sp	-					-					
	Tanytarsus glabrescens	-	2	2	€	2	2	7	12	2		
	Jerius	10	2			-	-		10	10	2	
	Orthocladiinae											
	Corynoneura celeripes					-			7	7	2	
	Corynoneura taris		- 	-				7				
	Cricotopus bicinetus		-	9	23	15	7				1	
	Eukiefferiella sp.				+	-		+		+	2	
	Renoctedius crassicornus	-	- † -	- - - -		1.			1			1
	Nanocladius distinctus		=		2	-	=	1			. ' 	

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WA.	WENUS SPECIES	01/4/7	4/C).	K/2/8	2/2/2	K/C/*	K/6/5	K/6/2	1	0/4/2	A 44	K/4/10
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	Manaciagius rectinervis	!			1	ī						
	Nanocladius sp.											
	Parakiefferiella sp.		13	10	3	1					2	
	Rheocricotopus sp.		-	-						2	2	
	Thienemenniella nr. fusca		38	8	25	51	36					2
	Thienemennielle xens											
	Unknown sp.	-									2	
	Tanypodinae				-							
	Ablebesmyle perejente		-	-								
	Ablebesmyia tarella		-		-							
	Labrundinia pilosella				· ·							
	Macropelopia sp.									7		
	Nilotanyous so.								7	2		
	Pentaneura sp.			 								
	Procledius sp.	60	-	-	-	-						
	Unidentified tampodinae	7		ļ. 		2	-					2
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	Ceratopogonidae			-								
	Alluaudomyia sp.											
	Bezzia sp.											
	Empididee											
	Hemerodromia			-	-							
EPHEMEROPTERA						-						
	Ceenis sp.			_								
	Ephemerella sp.											
	Tricorythodes sp.											
	Cimygmule subsequalis	1										
	Spinadis wellace											
	Unknown sp. A (squatty bodies)	+	1			+		Ì				
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	Perlinella ephyre											
	Immatures			_				15		8	2	2
TRICHOPTERA												
	Macronema zebratum							İ			!	
	Unknown hydropsychid sp.		:	Ì	•	r		•		•	Ì	•
	Mydroperie sp.	+	2 6	0 -	0	-	2 -	7	2,	7	٥	- **
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	Chimere sp.	+	^	3	•		5	-			7	
	Potycentropus sp.	†				1			1			
	Unidentified											
AMPHIPODA		+						+				
	Synurella sp.						-					
1 SOPODA												
	Asellus sp.											
ACARINA		7	191	-1	20	71	12	9	8	17	10	11

TAXA	Gerre Species	P\4\10	R\2\1	R\2\2	R\2\3	R\2\6	R\2\\$	R\4\5	RVAVZ	RYENG	4340	R\6\10
MOLLUSCA				I]						
PELECYPODA	Corbicule flumines		2	7	2	11	8	7	7	7	2	5
	Ferrissia rivularis	2										
	Amicole sp.			Η.								
	Gyraulus sp.											
	Unidentified											
OTHER												
NEMATODA		7			2	1				2	1	
NEMERTEA												
	Prostoma graecense			1		1			1			
TOTAL BANKS		K	156	153	166	13	121	701	9			
THE PARTY OF THE P		72	36	52	8	32	92	K	58			

APPENDIX C
COUNTS OF MAJOR TAXA PER CORE SAMPLE, FALL, 1988

Luxapelila Creek, Mississippi Samolino Date: 10/1988	id		\parallel		-				\parallel	\parallel	\parallel		\parallel	+	-	H	\parallel	\mathbb{H}	\vdash	П
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Secretarian Secretarian	TAXA	GENUS SPECIES	P\2\1	P\2\2	P\2\4	P\2\5	P\2\7	2/4	D\4\2	7/4/4	P\4\5	9\%\d	61914	5/d	10
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						-	1	l	1	L_:	1		H	
	Unidentified tubificidae	2	٥	3			3		80	3	7	7	7	7
	Enchytraididae													
	Berbidrilus peucisetus			1	1			1	+	+		1		
	Unidentified			-	-		-	-	+	1	1	-	+	
MIRUDINEA	Melobdella elongata			+	+		-	+	+	-		1	1	-
	Actinopoetta sp.	-		+	-		1	+		-	1	+	+	
AEOLOSOMAT IDAE	73.				+				+	-	+	+	+	T
ARTHROPODA											-	-	-	
INSECTA					-				-		-		-	
COLEOPTERA					-	-			-		_			
	Bidesaus sp.									H			H	
	Stenelmis sp.													
	Helipus sp.			~			-		-	-	-		-	2
	Hydrochus sp.								-	-				
COLLEMBOLA						1				1	\dashv	+	+	
	Sectionary palustris		1	1	+			2	+	+	-	1	-	
	Unidentified				\dagger			+	-	+	+	+	+	
DIPTERA										-			+	
CHIROMONID										-		_	-	
	Chironominae								-	.				
	Chironomus sp.					-		_	L	_				
	Cladopelma	2			,	H	-			-				-
	ē											_	-	
	Cryptochironomus sp.		-			-	2	٠	-				2	7
	neomodestus			-			-		-	1	_			-
				†	+	+		+	+	+	-	+		
					+			+	+	_	+	4	1	
	Endochironomus sp.								+	-	1	1	+	
	Glyptotendipes		ľ	1	+		ſ	+	+	+	+	+	+	-
	Milotherms babici		-	1	-		7 6	•	+	-	+	+	,	7
	Parachironomic abortivis				-	+	7	-	+	+	+	+	+	
	Paracladocelma undine			-		+	-	+	+	+	-			7
	Paralauterborniella nigrohalt	2	-	- 0	~	-	~		-	-	-	1	~	7
	Paratendipes albimanus								-	-	_		-	
	Paratendipes mudisquama									-			-	-
	Phaemopsectra dyair								+	-	1	_	1	
	Phaenopsectra flavipes			-	+		1	+	+	(1		-	-
	Polymedilum (11 incense			1	+		-	+	+	•	+	+	+	7
	Polypedilum nr. scaloenum	7	2	0	-	7	~	-	2	-	M	+	•	- 0
	Pseudochironomus sp.	-	~		~	~	7		+	-	-		2	9
	Robeckie sp.				-	-			-	-				
	Stenochironomus sp.								H	H	L			
	Stictochironomus sp.													
	Xenochironomus sp.										_		+	
	Unidentified chironomini							-	-		-	-	-	-
	Tenytersini				-	+		+	+	+	+	1	+	ľ
	Cladotamytarsus sp.			-	1	-	7		+	+	+	+	+	~
	Micropsectra sp.				-		1	+	+	٩	+	+	1	
	Kneotenytersus sp.		1	-	4	+	٠,		+	2	+	+	+	1
	stempetting sp.	=			L I	1				$\frac{1}{1}$		$\frac{1}{1}$	1	7

									_			
		- -									Ī	
	Stempellinella sp			1							1	
	Tenytarsus cortmans	+	-	+	7	~		-				
	lenytersus graph escens	,	3	+	2	7			-		Ī	
	amytarsus quertus	0	-		2	7			7		7	
	Orthor adjing	+					-					
	Corvioneura celeripes							<u> </u>	-			
	Corynoneura taris											
	Corynoneura sp											
	Cricotopus bicinctus	2	-	2	3	3	-				1	
	Cricotopus sp		-			ı						
	Eukiefferiella sp.	£				-						
	Nanocladius crassicornus		-	-		-			3		-	
	Nanocladius distinctus		-									
	Nanocladius rectinervis											
	Nanocladius minimus		-			-						
	- 1				3 2	2	2	-			~	
			-		-	-		-				
	Rheocricotopus sp.											
				-								
				-	-	֡֟֟֝֟֓֟֟֝֟֝ ֡						
			-						- -		-	
	Unidentified orthocladinae		-						2		=	
	Tanypodinae		+	-		ľ						
	Abt abesmy18 mat toon 1		-	- 6	•		,		•		•	
	Apt above my la parajanta	1		1	-		3	+			1	
	Ablabesmyla taretta		+	1	+			+	-		•	
	Limitalists of local is		-	+	-	-		1	-			
	Macrocal Column en		-		-			 				
	Natarala so	+		+					-			
	Milotaryous so.											
	Pentaneura so.			-								
		7	2	2	2	5	3	6	1		3	
	Unidentified tanypodinae	2				-	2			-	-	
	Diamesinae											
		•				1						
	Unidentified Chironomidae	1			1	2	ı				2	
	Ceratopogonidae											
	Alluaudomyia sp.			_			-		-		2	
	Bezzia sp.		2	1	m	2	7	2			7	
	Unidentified ceratopogonid		1	-								
	Employee	+	+	+				-				
	Tanviaridae		-	+				-				
	Simuliidae		-	<u> </u>				-				
	Símulium sp.			-								
EPHEMEROPTERA												
	Baetisca sp		-				1	-			-	
	Caenis sp.		-					-				
	Ephemerella sp.	_	-					-	-			
	Tricorythodes sp.		-				-		_			
	Cinygmula subsequalis	-		_								

TAKA	GENUS SPECIES	P\2\1	5/2/9	P\2\4	P\2\5	P\2\7	AVG	P\4\2	5 7\d	P\4\5	9\7\d	6/9/4	AVG	TOTAL
		- -												
	Spinadis waltace				2		-				2	2	2	E .
	Unknown sp. A (squatty bodies)													
	Unknown sp. B (stim guys)													
	Unknown sp. C													
	Unidentified								-				1	
CDONATA					_									
	Argia sp.													
	Macromia sp.		-											
	Archilestes													
	Dromogorphus sp.		-				-			Ī				
	Immetures				_									
PLECOPTERA			-		_									
	Perlinella ephyre					-								
	Immetures													
	Unidentified					-				-			1	
TRICHOPTERA														
	Ceracles													
	Macronema zebratum		-		-									
	Hydroptila sp.					1	-	-	2	2	-	-	2	
	Occetis sp.			-			ı				2		-	.,
	Chimerra sp.			2	2	3	3	7		7	~	2	7	_
	Polycentropus sp.									ı			-	
	Lype diversa													
	Unidentified													
AMPH I PODA					_									
	Synurella sp.													
I SOPCOA														
	Asellus sp.	1												
ACARINA		-		-	7	~	3	-	3	5	2		7	8
MOLLUSCA														
PELECYPODA	Corbicula fluminea	2		2	3	3	7		2	3	-	7	7	•
GASTROPODA	Ferrissia rivularis							-						
	Amicola sp.					-								
	Gyraulus sp.													
	Unidentified											-		
OTHER										7				
NEMATODA			2	2	3		3	5			•	-	3	9
WEMERTEA		1	-				2	-					1	
			-		_									
									1			1		

Luxapalila Creek, Mississippi	iggissis			_			-			-	-	-	-		-				-	
Sampling Date: 10/1988	9							_					-							
Lx1088C																				
90 0000				 -			+	+		+		+	+	+	+	1		1	1	
מינים ביים שפיום נפצפי ופא מפונפ	100 HB .			16		10004	11			1	+		+	1	\dagger					
to those samples localities to species,	8	200		5	Paring a		-		2	Cara	-		-				+			
								+-1	÷	+-1	+-1		+	+						
TAXA	R/3/1	R/1/1 R/1/2	8/1/3	8/1/4	R/1/5	R/2/1	R/2/2	R/2/3	R/2/5	R/2/9	R/3/1	R/3/2	R/3/3	R/3/6	R/3/9	8/6/4	8/4/5	8/9/8	8/4/9	8/4/10
Turbellaria	F			2		M		M	5	-	-	1		+	2			Ī		
Oligochaeta	16			21		23	25.6	7	15	10	37	39	28	127	42	80	17	19	92	•
Chironomidae	85	83	81		58	194	125	183	172	191	57	29	52	57	69	12	22	7,9	13	20
Ceratopogonid																3				
Coleoptera											-						-	-		
Ephemeroptera		2		•	9	-	2	-			_	2		7				10		7
Odonata			_																	
Plecoptera		2		7			-			2		-					2	2	-	
Trichoptera	-	2		1	2	2	-	=	7	17	2	٣	æ	_	~		9	60	7	
Amph i poda																				
Isopoda																				
Bivalvia	15	16	15	•	9 10	٥	12	17	9	2	.E	9	2	2	8	٥	2		7	7
Gastropoda					٥											2				
						1		1			1		1							
MINOR GROUPS		ı	ŀ									- 	-							
Acarina	17	12	8	~	5 13	2	33	2	22	82		2	16	2	12	7	٥	12	10	,
Polychaeta										-	- 									
Rirudinea							_							-		-				
Empididae																				
Coltembola																				2
Nematoda	2				3	-	€0		1		1	-	3		3	7	2		2	2
Nemertea	1		-	2		7	-	2	2				-			3	-		-	
Aeolosomatidae																				
fanyderidae																		2		
	_																			
TOTAL	140	136	159	151	131	272	208.6	548	239	233	130	130	127	137	185	\$3	2	8	19	69
						1		1						1			-		1	
				_	1					+					1	1			1	
						1				1	1	1								
				_					_	-			_					_	_	

Luxabalita Creek, Mississ	iooi		-	}-	-	-		-	-	}	-	\mid		
Sampling Date: 10/88											<u> </u>			
Lx1038SQ									+			+		TOTAL
4444	S.M. C. C. C. C. C. C. C. C. C. C. C. C. C.	100	61.51.9	7,5,4	2,2,6	01610	P KEO	7776	-31718		101/10	- JUN 17 14	PKEG	- KEG
Santata Santa Co	CENCS SPECIES	4 (6)	R 16 16	L	L	1	+	Т		1		Ŷ.	•	2
TURBELLARIA			1		-	+				+	+	+	1	
	Dugesia tigrina	_		F	2	-	13		-	-		-	-	2
	Planeria sp.				-				H	-				
	Unidentified													
ANNELIDA														
POLYCHAETA								_			_			
OLI GO CHAFTA	Sparganophilus	- †	-		-	-								
	Haplotaxidae					<u> </u>	1			-				
	Lumbriculidae	9	~	-	-	2	~	9	9	-	2	3	~	80
	Naididae			-		1		+	1		-	1		
	Amphichaeta leydigi			+	-	-	-		+	+		1		
	Bratislavia bilongata		+	-	-	$\frac{1}{1}$	+	+	1	1	-	+		
	Bratislavia unindentata		1	+	+	+	+	+	+	+	+	+	1	1
	Chaetogaster diaphanus			+		1	+		+	\downarrow	+	+	7	
	Dero digitata		-	+	+	+	+	+	+	+	+	+	1	Ī
	Dero furcata	-	Ē	-		-	1.	+	\dagger		+	-		
	Dero nivea	7	3 (- -	1	1		1	+		+	+		
	Dero optusa		7	-	0	1	3 .	+			-	+		*
	Dero trifida		7	1	+	-	-	+	+	+	•	$\frac{1}{1}$	1	
	vero sp.		-	-	+		+	-	+		1	+		-
	Nomochaeta naidina	+	+		+	1	1			+		+		
	Maile Properties			+		1		+	+	+	+	\dagger	1	
	Natio Commission		-	+	+	+	+	+	\dagger	\dagger	1		T	
	Nais pardalis	~	7	-	-	~	2	-	+	-	-	+	~	_
	Mais pseudobtusa	-			-		-			-		-	-	2
	Nois simplex	2		-			-	-	-	-	-	-	-	2
	Nais veriablis	2	-			80	2		-		-	-		<u> </u>
	Piquetiella michiganesis							_		٥			-	-
	Pristing equiseta			 	_				-	-			~	2
	Pristing leidyi											-		
	Pristina synclites				_							-		
	Pristina sp.				+	\dashv	-	+		1		=	-	
	Pristinella jenkinae		1	+	1	1	-				-			
	Pristinelle longidentata			+		+	+	+	1	+	+	+	1	
	Pristinella longisoma	•	-	1	+	+	-	+	\dagger	+		+	1	-
	Pristine (18 osporn)	1	-	1	+	+	7	+	$\frac{1}{1}$	+	+	+	†	1
	Slavina accendiculata		-	-		-	-	+	+	+	-	-		-
	Specaria josinae			-	-	-		-			-		-	-
	Stevensoniana trivandrama			-		-								
	Unidentified naididae	-					-							-
	Tubificidae													
	Autodritus timobius													
	Autodritus piqueti			+	-	+			+	+	-	+	=	-
	Autodritus pluriseta		1	+	+	+	-	+	+	$\frac{1}{1}$	+	+	1	٢
	Branchiura sowerbyi		-	-		+	2		+	+	+	+	†	7
	l'immodritus nottmeisteri	-	+	+		+	-		+	+		+	+	-
	Dotamothrie veidovetvi	1	+	+	-	+	-	-		+	-			
	. (15,00)]	1	1

							_		_	_		
	Unidentified tubificidae		2	2	2	2						
	Barbidrilus paucisetus		-					80			1	
	Unidentified		5.6	-	1	7		-	3	-	3	
HIRUDINEA	Helobdella elongata	-			+		=	-			-	
	Actinobdella sp.	<u> </u>		-	+		+	1	-			
AEOLOSOMATIDAE	7	-	-				-	-		2	2	
AR THROPODA												
INSECTA			-	-	-	-	-	+				
רטרנטי ובאא	Bidessus sp.	+-	-	-	-		-	+	-			
	Stenelmis sp.											
	Halipus sp.			-				-	-		2	
	Hydrochus sp.			+	-		+	+	1			
COLLEMBOLA	feature palietric		+	-				+	-			
	Sminthurides so.	+-	-		-		-		-			
	Unidentified									2		
DIPTERA			+	-	-		+	-	-			
TOWOUT IN	_ [-	+	-		-		-	-				
	Chieses		+	+	+	-	-	+				
	Cladonims sp.	1	+	1	-		+	-	-			
	Crystochi ronomus fulyus	1	-	-	-		-	-				
	Cryptochironomus sp.		-	-			-					
	Dicrotendipes neomodestus	1 27.72	7 5.2 4	14.66 21	21.06 13.18	\$						
	Dicrotendipes nervosus Type 1	-					-	2	-		2	
			1					+	+			
	Glyntofendines	+	+				-	-				
	Harnischia sp.		-	-	-			_	-			
	Nilothauma babiyi											
	Parachironomus abortivus						-					
	Paracladopelma undine	9, 100	+	-			-	•		-		
	Paratendines albimanus		-	-				-	 -			
	Paratendipes rudisquama						-	-				
	Phaenopsectra dyair											
	Phaenopsectra flavipes	-					-	-	-			
	Polypedilum convictum	15.82	+	-	5.51	2	+	1	+	1		
	Polypedium it thouse	+	+	7 11	98 0	2	1	1	0	7	7	
		†					-	•				
	Robackia sp.	-	-	-	-		-	2	2	2	M	
	Stenochironomus sp.	-										
	S						-					
	Xenochironomus sp.				-		_	1				
	Unidentified chironomini	-	5.6		-	-	4	+				
	Tanytarsini	+	+	-	1		1	1				
	Microseofts sp.		-					+				
	Sheotanytarsis so.	11.88		7	7.02	2	-		-	-	-	
		1										

			4 16 16	ı	ı	10.0				ı		ı	1	•
AKK	DENUS SPECIES	*/c/-	7/2/x	2/2/2	()	2/2/2	3	X/4/4			K/4/V K/4/10	110 AVG	1014	J
	20 2112211222	†	+							+		-		T
	School (mella Sp			-	$\frac{1}{1}$			1					-	Ţ
	lanytarsus cottmani		+		-	-		7		-			- -	7
	Tanytarsus glabrescens	76.7	+	3.67	5.51	19.76	3	-		7	1		7	0
	ianytarsus querius	3.96		-	+	-				5			-	7
	Unidentified tenytarsini		1		3.51		-			-			-	~
	Orthocladiinae		+	+	+					+				1
	Corynoneura celeripes	,			+	ļ				1	1	1	+	T
	Corynoreura (aris	3.70		+		-		1	1	1	1	ļ	•	- [
	Corynometra		1,	1		100		-		-		-	7	7
	Cricotopus Dicinctus	2	4.	8	35.	25.00	7		1	-	+	13	= -	•
	Cricotopus	-		+	1	<u> </u>	-		1	7			- -	-
	EUKTETTET BE SP.	18		+	-	1		-	+	7			-	
	Marioc Ladius Crassicornus		+	+	+		=						+	
	Manocladius distinctus	1	5.2		-	3.29	2						_	~
	Nanocladius rectinervis			+	1					1				1
	Manocladius minimus	-	1											٦
		- 			-	-		_				_	_	
	Parakiefferiella sp.				-								4	
	Rheocricotopus sp.	-	-											
		_	-						-			_	-	-
		63.36	13	80.67	87.75	85.65	2			7			-	٥
	Thienemanniella xena	23.76					-							-
	Unidentified orthocladinae		5.2	7.33	7.02		3							m
	Tanypodinae													
	Ablabesmyia mallochi		9.6		-		-				-	-	-	2
	Ablabesmyia parajanta	3.96	5.2	3.67			3				+	2	-	3
	Ablebesmyie terelle												-	
	:		†		-					1		-	-	7
	Labrundinia pilosella			+		-			1	7		-	~	~
	Macropelopia sp.			+				•			-		-	Ţ
	Natarsia Sp	1		+	+				1				-	7
	Wilotanypus sp.			1	+					1			+	T
	Pentaneura sp.			+	+	+				1	-		-	ľ
	Procledius sp.									-	=	_	7	7
	Unidentified tanypodinae			1	1				=		_	1	-	-
	4													
	Potthasea		:	,	3	100		•	1	1		-	1	ľ
•	Unidentified	2	2	?	9	8:		2	^	-	+	-	•	<u>^</u>
	Al limitation		1	1	-	+			1	1	-		-	
	Retrie of	-	+	+-	1	Ī	!		1		-			İ
	Unidentified	+	:	+	-	! 	:	7					-	
	Empididae	-		-	-									
	Hemerodromia				-									Γ
	Tanyderidae									2	-		2	2
	Simuliidae													
	Simulium sp.	-			-				1	~			-	-
EPHEMEROPTERA				+	1								4	
	Baetisca sp	•		1	-	1		-		+	-		+	
	Caenis sp.	-		1	+	+			1	1	-		+	T
	Epiemerella sp.	-	-		+	+	,	1		-	+		-	•
	Cinconsis estancialie	1	-	+	+	+	7			1	-	-	-	1
	Cranonama en	+	-	- 	-		,		+	-	-	17	-	14
	sterior sp.				.! 								1 1	7

Spinds authors Spinds Sp	TANA	CENTS COEPTES	16 10	6 16 10	21610	315.10	0,5,0	21.4	1						
Sprinadis validace Sprinad	200	WHICH IN THE PROPERTY OF THE P	1 3 4	7 1 V	1	2 2 2	7 (5)2	3	2	2	2			200	LO: AL
Spinates at all access					-	-									
Unknown SP		Spinadis wallace	-		_					_					
Unknown Sp. 6 (stim guys) Unknown Sp. C C C C C A															
Unidentified Unidentified		Unknown sp. 8 (slim guys)													
Argia sp. Inidentified Inident		Unknown sp. C													
A		Unidentified													
National Sp. Nati	!														
Macromie sp. Macromie sp. Architesters		Argia sp.													
Dromogoneplus sp.		Macromia sp.													
Dicomognophus Sp. Dicomognophus Sp. Imatures Im		Archilestes													
Immetures Imme		Dromogomphus sp.			-										
Perline Perline Leaphyre		Immatures					-								
Perlinelle ephyre Perlinelle ephyre	PLECOPTERA			<u>-</u>		-									
Immatures Imma		Perlinella ephyre		 		 									
Unidentified 1 2 2 2 2 2 2 2 2 2		Imatures													
Mecromea zebratum 1 1 1 1 1 1 1 1 1		Unidentified		-		_	2	2		2	3	-		3	2
Nacronema zebratum	TRICHOPIERA					_									
Macronema zebratum Macrone		Ceraclea sp		-				-							-
Hydroptile sp. 6 6 6 6 1 16 6 6 6 1 16 6 6 6 1 16 6 6 6 10 16 16 16 16 16 16 16 16 16 16 16 16 16		Macronema zebratum													
Chimers sp. Chimers sp.		Hydroptila sp.	ō		9	7	16	7			7				5
Polycentrous sp. 1 1 2 2		Oecetis sp.		-	7	2	-	7		7					2
Polycentropus Sp. Lype diversa		Chimerra sp.	_		-	-		2		2	7	7		3	2
Lype diverse Lype		Polycentropus sp.													
Unidentified Syrucella sp. 30 33 24 27 28 5 2 2 2 2 2 2 2 2 2		Lype diversa													
Asettus sp. Asettus sp. Apoda Corbicuta fluminea 9 12 17 10 5 2 6 OPODA Ferrissia rivularis Gyrautus sp. Unidentified 2 2 2 2 4 3 7 4 1 2 2 2 4 3 3 7 4 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1		Unidentified													
Symurelle sp. Asellus sp. 30 33 24 27 28 5 2 2 2 2 2 2 2 2 2	AMPHIPODA														
PPODA Corbicuta fluminea 9 12 17 10 5 5 6		Symurella sp.			-	 									
PPODA Corbicuta fluminea 9 12 17 10 5 5 6	1		1	-											
PPODA Corbicula fluminea 9 12 17 10 5 6 OPODA Ferrissia rivularis 9 12 17 10 5 6 Amnicola sp. Gyraulus sp. 6 2 2 Unidentified 2 2 4 3 A 4 1 2 4 3		Asellus sp.	-		1	-	5			(5	,		
YPCDA Corbicula fluminea 9 12 17 10 5 6 OPCDA Ferrissia rivularis 6 6 6 6 6 6 6 6 7 3 7 4 3 7 4 3 7 4 3 7 4 3 7 4 3 7 4 3 7 4 3 7 4 3 7 4 3 7 4 3 3 7 4 3 4 3 4			2	55	3	/2	8	2	7	2	72	2	1	1	2
ANSTROPODA Ferrissia rivularis Amnicola sp. Gyraulus sp. Unidentified 2 MIDDA 1 8 1 3 7 ERIER 4 4 3	PELECYPODA	Corbicula fluminea	6	12	17	10	- 15	5	9	3		7	7	7	٥
Annicola sp. Annicola sp. 2 Gyraulus sp. 2 Unidentified 2 AATODA 1 8 1 3 7 ERIER 4 1 2 2 4 3	GASTROPODA	Ferrissia rivularis				-									
Gyraulus sp. Cyraulus sp. 2 Unidentified 2 Midon 1 8 1 3 7 ERIER 4 1 2 2 4 3		Amnicola sp.			-	-	-								
M100A Unidentified 2 M100A 1 8 1 3 7 ERIER 4 1 2 2 4 3		Gyraulus sp.	-	 	-										
M100A IERTEA 4 1 2 2 4 3		Unidentified			-		-		2					-	
4 1 2 2 4 3	OTHER					-									
4 1 2 2 4	NEMATODA		-	80	_	-		3	2	2		-	2	4	7
	NEMERTEA		7	-	2	2		4	3	1		1		3	2

APPENDIX D
SPECIES COMPOSITION IN SPRING, 1989 SAMPLES

Luxapalila Creek, Mississippi	SSiDD			L				ļ			-	ŀ	-	-	-	-	-	-	
Sampling Date: 6/1989											-	ŀ	+	-	-	-	<u> </u>	+	1
LX689cnt					L							-		-		-		L	L
													\mid	-	L	H		L	Ļ
Counts of major taxa: raw data	ew date										_		_	_					_
(for those samples identified to species, counts ar	ntified to sp	pecies,	counts		summed here	e, all others	8re	raw data)	~					-				-	L
										1			H						
TAVA	27470	0717K 0717 C	77.6.0	9/ 9/ 8	— .	20476	1	7				_	-		_		_	_	
	277.72		2/2/2	2	*	1/5/3	1/2/2	2/2/2	2/5/2	1/2//	2/2/2	0/2/4	1/6/	P/3/7 P/3/9 P/3/10	2/10 2/2	6/4/3 B/4/2	12 1/4/7	2/7/4 /2	6//10 6//10
Turbelleria	-							3	-	İ		-	+	+	+	+	+	-	1
Ol igochaeta	19		72				_	3		9	12	- 2	15	=	19	0			
Chironomidae	20	30		25		3	32	39	2	9	32	9	2	2	22	. 22	2 2	77	27
Ceratopogonid					2					-			:	+	1	 -			
Coleoptera					-			-		T		\mid		+	-	+	-	1	
Ephemeroptera								-				-		~	~	-	-	-	-
Odonete								_					\vdash	+	~	-	<u> </u>	-	
Plecoptera											-		\vdash	-	-	L		-	L
Trichoptera			1		-		-	-	~						-	_	-	-	_
Amph i pode									2	-				-	L	H	-		L
Isopode												-	-	-	-	┞	L	-	L
Bivalvia			2	7	~		-	2 3	m		٣		-	-	-	-			L
Gastropoda			1							2			\vdash	_	-				_
													-	-	-	_		L	L
HINCE GROUPS											-	\vdash	\vdash		-				L
Acarina							1			_	٣		3	_	-	-	-	-	2
Heteroptera														-	-	_	_	L	L
Polychaeta													\vdash	-	_	L	L	L	L
Hirudines	1							_				-	-						
Empididae													H	L		-	-		L
Collembole		~						_					-	_			L	L	L
Nematoda	4	_	~	^	2			3 1		٥	-					11	9	2	0
Nemertee													L.,	_	_	_	L	-	L
Simuliidae													Н		_			_	
Aeolosomatidae												_	-	_		-		_	L
Tanyder idae													H						
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TOTAL.	\$\$	5	8	28	ĸ	3	8	45	2	2	25	30	1,	\$ 7	59	95	16	77 77	\$
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								1		+	†	\dagger	\dagger	+	+	$\frac{1}{1}$	$\frac{1}{1}$	1	\downarrow
								\downarrow		†	+	\dagger	\dagger	+	+	+	+	-	1
												1	$\frac{1}{2}$	+	+	-	4	-	

Interestine Creek Miceicainni		-		-				-			
Sampling Date: 6/89			!		-	+					
Raw species data: LX689RAW		2116									
TAXA	GENES SPECIES	P1213	P1216	P1215	P) 2\6	P\2\7	P\4\3	6/6/5	61617	81414	D1 / 7 / d
HELMINTHES			-	-	-	-		-			
TURBELLARIA											
	Dugesia tignina		2	2	-		+				
	Planeria sp.		1		-	-	1	-			
ANNELIDA			-								
POLYCHAETA						-					
	Spergenophilus		 								
	Naplotaxidae										
	Lumbriculidae			-	-						
	Neididee		+	+		+		-			
	Agonichaeta leydigi	1						1	1	1	
	Bratislavia Dilongata	+	+	+		+					
	Chaetogester discharus									1	
	Dero digitata	+ -									
	Dero furcata						-				
	Dero nivea										
	Dero obtusa										
	Dero trifida			-							
	Dero sp.										
	Homochaeta naidina										
	Nais Dehning!					+					
	Weis Dretscher		+	+		1	1				
	Wass Communis								1	1	-
	Mers et inquis		+	+				-			-
	Maria parcaris				+						
	Mate eight ex						Ť				
	Maie Variablis		+	-			†				
	Piquetiella michiganesis							-			
	Pristing acuiseta					-					ľ
	Pristing Leidyi										
	Pristina synclites										
	Pristing sp.										
	Pristinella Jenkinae				1			-			
	Pristinella longidentata		-		+			+			
	Pristine (a longisoma										
	Driestral la sign										
	Stavina appendiculata										
	Specaria josinae	-	-	-		2					
	Stevensoniana trivandrama	-		-							
	Unidentified naididae										
	Tubificidae				- ;	1					
	Autodritus Limnobius				+	+					
	Autodritus piqueti		+		+	+					
	Aulodrilus plurisete		+	1	+						
	Liamodrilus hoffmeisteri	1		:	† 	1					
	Limnodrilus rubripenis			 			-				

	action of the contract of the	21212	, ,	2,757	2	72					2
	Potemothrie veidovekvi	+	+	+	+		1			1	
	Indentified schifferidge	-			+						
	Factorial distriction	+			+	J -	+			 	
	erchytraldidge		+	+	+	-	1			+	
	Beroidrille paucisetus					+	0				
4391.01817	Weight in a least			1	-						
	Articopula en	1								+	
	Unidentified										
AEOLOSONAT IDAE			_								
ARTHROPODA					-						
INSECTA											
COLEOPTERA		-	-								
	Bidessus sp.										
	Cychon					-					
	Halinas en			-		-					-
	Wydrochus so.				-						
3	Stenelmis so.										
COLLEMBOLA			-		-						
	Isotomurus palustris										
	:			-							
	Unidentified									-	
DIPTERA											
CHIROMONID											
	Chironopinae										
	Chicocomie en		-								•
	Cladopelma		+		-				l		
	Cryptochironomus fulvus				-	-	2				
			-	-		-					-
	Dicrotendipes nervosus Type 1	M			-	2	2	٥	€0	7	10
	Dicrotendipes nervosus Type 11					-					
	Endochironomus sp.	-	2								
	Glyptotendipes			-		+					
	Harnischia sp.			-				-			
	Microtendipes							2	-		
	Witothauma babiyi				-						
	Parachironomus abortivus					1					
	Paracladopelma undine			1				2			
	Paralauterborniella nigrohalteralis	2	-	2	-	~	2		7	~	~
	Peretendipes albimanus										
	Peretendipes nudisqueme								Ī		
	Phaemopaectra dyair			1				2	5	-	-
	Phaemopaectra flavipes	+	-		1					1	
	Polypedilum convictum	+									
	Polypedium railex	-		+			ľ			-	
	Polyperium illinoense			1	1	-	- 6	1	7	7	ľ
	Polypedium nr. scaloenum	•	3	0	7	2	•	•	7	2	
	Pseudochironomus sp.										
	RODECKI B Sp.			1			^			+	
	Seferachi comus sp.	+		+	+					\dagger	
	Tribelos so	12	+	-	1		-			+	
	Xenochironomus sp.				-					-	
	Unidentified chironomini		+					~		+	

47.44	60.6000 01.6000	4,5,0	1,510	316.14	7 10 14	4 10 10		31,710	*****		101.11
	27.11.0 201.12	7 7	100	7	212	1				2	
	Tenytarsini			+	+	+	+	+			
	Ciadotanytarsus so.	-	-	-	-	-	-		ļ		
	,		2	-		-	-				
	Micropsectra sp.		2				-	-			
	Rheotanytarsus sp.						-			-	
	Stempellinella sp										
	Tanytarsus coffmani		-								
	Tanytarsus glabrescens	1	= ;		-		+	1		1	
	lamytarsus querius	r	2	=	-	3	+	^	2	=	Ю
	Oniociti indication			-			+		1		
	arilia Arilia							ļ		-	
	Corynoneura celeripes		-				-				
	Corynoneura taris			-					-	-	
	Corynoneura sp						-				
	Cricotopus bicinctus										
	Cricotopus trifascia										
											1
	Eukiefferiella sp.									-	
	Nanocladius crassicornus										
	Nanocladius distinctus				-	-				2	2
	Nanocladius rectinervis				-	-	-				
	Menocledius minimus				1	-			-		
	Nanocladius sp.			-	-	-		1			
	Parakiefferiella sp.		~		-	1					
	Rheocricotopus sp.				-	-	1				
	Intenemental of tusca		+	+	1	+	+	1			
	Interchantified orthor adiose					+		+			
	Tentrodine			 -		-	1	+			
	Ablabesmy is mallochi			-		-	+	-		-	-
	Ablabesavia para janta			-	-		-	7	-	-	7
	Ablabesmy is tarella										
	Clinotanypus										
	Labrundinia pilosella								-		
	Macropelopia sp.										
	Natarsia sp		1								2
	Wilotanypus sp.										
	Pentaneura sp.		-	-		-			Ì		
	Procladius sp.			2	-	-	1		=	-	
	Intenemental					-		-		•	í
	Diezerinea tanypodinae					,	+	,		-	,
	Pottheia					-					
	Unidentified Chironomidae		9	9	-	9	2	-	-	3	3
	Ceratopogonidae										
	Alluaudomyia sp.		-								
	Bezzia sp.				-	-	•			2	
	Unidentified ceratopogonid										
	Empididae		1			+	+				
	Hemerodromia		+			-	+	-			
	Circ. 1 i dae						+				
	Similar co		†-		+	+	-	+			
	, de										

2	TAXA	GENUS SPECIES	P\2\3	5\2\d	P\2\5	9\2\d	P\2\7	P\4\3	P\4\5	6\6\7	8/9/4	P\4\10
Desiring a partie of parties of	200000000000000000000000000000000000000											
Continuence by Cont	EFFERENCY LEKA				1							
Comparison of the control of the c		Beetisca sp							_			
Experience of Experience of		Caenis sp.			-							
		Ephemerella sp.		-			-	-				
Christian state Christian		Isonychia					 -					
Sterocras B. Ster		Tricorythades so.	-			+						
Stereotron B. Stereotron B		Cinvomile subsecusiis				$\frac{1}{1}$			1			
Springis will listed		Stenocron en		-	-			-				Ī
Discount 19. A Liquetty boiltes) Discount 19. A Liquetty boiltes) Discount 19. A Liquetty boiltes) Discount 19. A Liquetty boiltes) Discount 19. A Liquetty boiltes) Discount 19. A Liquetty boiltes 19. A Liquetty 19. A L		Stenonena en		-		+		+	+		•	T
Unidentified Westerly bottes) Unidentified Westerly bottes) Unidentified Westerly better Westerly better Westerly		Spinadis ual lace			1	+						
Univident Fig. Cit in per		Unknown on A (squatty bodies)	†		-	+			1			
Unidentified Unid		Unknown so. B (slim anys)				+						
Meteoritied Meteoritied						+						
Metrone 18 Metr		Unidentified				+		1				
Argie sp. Argi												
Argie sp. Recreate sp. Innextures Innex		Mesovelia		+					1			
Netrolite sp. Arris sp. Arris sp. Arris sp. Arris sp. Arris sp. Arris sp. Arris sp. Arriverses sp. Arrive	COOMATA							-				
Macroine ap. Macr		Argia sp.										
Perclinates Architecture Archi		Mecromia sp.				-						
Interestives Interestination Interestination Interestination Interestination Interestination Interestination Interestination Interestination Interestination Interestination Interestination I		Archilestes										
Immittees Immi		Dromogomphus sp.								1		2
Immediate splyre		Immetures										
Immetrices Petritoria ghyre	PLECOPTERA							_				
Unidentified Corpeties C		Perlinella ephyre										
Unidentified Unid		Immatures										
Marcie Macroene zebratum 1 1 1 1 1 1 1 1 1		Unidentified		-								
Necrotical Exercises Content of the Content of	RICHOPIERA											
Mydropticine aboratum High continues are a continued as properties a		Ceracies		+								
Objectis sp. 1		Hacronema Zebratum	1	1	1							
Objective sp. 1		Mydroptile sp.	=									
Corbicule flumines 1 2 3 3 4 6 11 6 22 15 15 15 15 15 15 15		Decetis sp.		-		-			-			
Dolpe diverse		Chimerre sp.			1	7						2
Unidentified Unid		Polycentropus sp.										
Syrurells sp.		Lype diversa						:				
Synurelle sp.		Unidentified								-		
Asellus sp. Asellus sp. Corbicula filminea Ferrissia rivutaris Amicola sp. Widentified Unidentified Unidentified Sp. 21 76 56 51 18 16 27 28 38 44 62 39 44 6	ATTENDA		+	+					1			
Asellus sp. Corbicula fluminea Ferrissia rivularis Amicola sp. Oyraulus sp. Unidentified		Comments on				•	1		1			
Asellus sp. 1 2 3 3 1 1 2 3 1 1 1 2 2 1 1 1 2 2 1 1 1 1 2 3 3 2 1 1 2 3 3 3 3 3 3 3 3 3 3 4 <td< th=""><th>ISOPODA</th><th></th><th></th><th>+</th><th>1</th><th>2</th><th>-</th><th></th><th>1</th><th></th><th></th><th></th></td<>	ISOPODA			+	1	2	-		1			
Corbleula fluminea 1 2 3 3 2 Ferrissia rivularis Amnicola sp. 2 8 8 Amnicola sp. Oyravlus sp. 8 8 8 Unidentified 3 1 6 11 6 2 9 Unidentified 3 1 6 1 1 9 1 3 1 6 1 1 9 1 2 1 6 1 6 2 9 1 2 1 1 1 1 1 1 1		Asellus sp.							+			
Corbicula fluminea 1 2 3 3 2 3 3 4 6 11 6 2 9	ACARINA					<u>.</u>			-	-	2	7
Corbicula fluminea	MOLLUSCA											
Perrissia rivularis Commissia rivularis	PELECYPOOA	Corbicule flumines	-	2	n	£						
Manicole sp. Mani	GASTROPODA	Ferrissia rivutaris					2					
Unidentified Unidentified Unidentified 3		Amicole sp.										
3 1 6 11 6 2 9 1 1 6 1 1 6 2 9 1 1 1 6 1 1 1 6 2 1 1 1 6 1 1 1 6 1 1 1 6 1 1 1 1		Gyraulus sp.			1							
36 51 45 21 76 56 51 44 62 79 75 76 56 51 18 18 16 77 75 75 75 75 75 75 75 75 75 75 75 75		unidentified	-		+	-	+					
36 51 44 68 51 44 68 57 57 15 15 15 15 15 15 15 15 15 15 15 15 15	MEMATODA		+	-	+	+	7	•	1	•	-	
36 51 76 22 15 18 16 22	NEMERTEA				- -	-		=	•	5	*	
36 51 62 21 76 56 51 44 62 22 15 18 18 16 22												
11 20 17 16 22 15 18 16 25	TOTAL MANBER PER CORE		9,	- 53	57	7	7%	> \$	- .,		79	**
	NUMBER OF SPECIF		-	20	15	16	22	15		91	12	1

Luxabalila Creek, Mississippi	iggisi			-	H	-	-	-		-	-		-	-	-	\mid					ſ
Sampling Date: 6/1989					H		<u>-</u>														
LX689cnt																					
Counts of major taxa: raw data	₩ data			_		-		-	-												
(for those samples ident	rified t	o spec	ies, c	ounts		summed h	here, all	lothers	976	raw data)											
5	Site			-	+	İ		1	+	+	-			+							
TAXA	-	8/1/2	R/1/4	-1	R/1/5 R/	R/1/10 R	R/2/1	R/2/5	R/2/6	R/2/7	8/5/8	R/3/1	R/3/2	R/3/4	R/3/5	R/3/7	8/4/1	R/4/2	R/4/8	R/4/9	4/4/10
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Turbellaria		3			-	-	-	 						-							2
Oligochaeta	2	36		=	80	m	12	~	13	12	17	77	2	13	×	97	2	0	0	-	-
Chironomidae	3	2		9	3	7	26	9	37	K	2	35	38	9	338	39	17	72	80	12	23
Ceratopogonid					_		-				-		İ								
Coleoptera				L.						-		-									-
Ephemeroptera						-	72		11	15	-	2	2	2	\$	7					
Odonata					_			-							78 . 78 . 84 .						
Plecoptera						_		 				2			20 See 15 See		r	1	2	•	7
Trichoptera	5	2				-	15		21	81	9	9	9	-	22	22				-	
Amph i poda		2				-	 	-													+
1 sopoda														1629	5,000 to 500.						
Bivalvia	7	11																			
Gastropoda	2																				
														1							
MINOR GROUPS				_	_									363							
Acarina	2	-			-				2	_	-	-	-	0.00	15	9	3	-	1	1	2
Heteroptera									-												
Polychaeta				_	\parallel																
Hirudinea				-	-	-															
Empididae				-	-	-															
Collembola	1			-	\dashv	-	1			-				-		+					
Nematoda	4	4		2	7	-		7	~					9	2	•	^	7	^	7	
Nementea				4	-	-	-						1		- 1						
Simuliidae				-	-				7	33	-		-								
Aeolosomatidae				4	-						i										
Tanyderidae				-	4	1						 			15. 1						
	1		ı	_	-	_	- 1								1			7			
TOTAL	ž	2	6	6	28	8	113	45	¥	233	63	63	જ	8	430	118	32	೩	38	20	35
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Luxapalila Creek, Mississi	iog					-				_	-
Sampling Date: 6/89											
Raw species data: LX689RA	2										
	GENUS SPECIES	R\2\1	R\2\5	R\2\6	R\2\7	R\2\8	R\4\1	8/6/2	R1418	R1419	R\6110
PLATYNELMINTHES											
TURBELLARIA											
	Dugesia tigrina Planaria sp										2
	Unidentified										
ANNEL IDA											
POLYCHAETA											
4	Sparganophilus										
	Haplotaxidae										
	Lumbricutidae	7		-	3	-					
	Naididee										
	Amphichaeta leydigi			-							
	Bretislavia Dilongata										
	Chaetodaster diarbaris										
	Dero digitata										
	Dero furcata										
	Dero nivea										
	Dero obtuse										
	Dero trifida										
	Dero sp.										
	Nomochaeta naidina										
	Nafs behningi				[1	1					
	Nais bretscheri										
	Nais communis										
	Neis elinquis										
	Mens perdal 18										
	Mens pseudootuss										
	Mans Simplex						ļ				
	Mais Variabils										
	Properties of michiganesis	P	•	•	1						
		^		-	^	٥				-	
	Pristina sp.										
	Pristinella jenkinae										
	Pristinella longidentata										
	Pristinella longisoma										
	Pristinella osborni	2		7							
	Staving spendiculate										
	Specaria josinae										
	Stevensoniana trivandrama	7	-	-	2	5					
	Unidentified naididae										
	Tubificidae										
	Autodrilus limmobius										
	Autodritus piqueti										
	Autodritus pluriseta										
	Branchiura sowerby:										
	L'IMPROUTICUS MOTTIMETS CETT								1	1	
	Cimmodritus ruoripenis								1	1	-

TAKA	GENUS SPECIES	R\2\1	R12\5	K/K/0	R\Z\	R\2\8	R/4/1	R1612	8/4/8	8/4/9	R\4\10
	Doctor of the Control	+		-				+			
	Inidentified whiting	-	-		+						
	מיווספונון ופס ניסון וכוסשב	- -	+	3		-	-				
	Enchytraididae	-		1			+			1	•
	Barbidrilus paucisetus			,	- -	+	1	1	1		
		,	+	2	8		=				
HIRODINEA	Accidenta elongata	+			+						
	Unidentified	+-	-		-				-	-	
AEOLOSOMATIDAE		+									
ARTHROPODA				-	-			-	-		
INSECTA		-			-	-					
COLEOPTERA											
	Bidessus sp.										
	Cyphon		_		-						
	Q					_					-
		-			-		- †				
1	Stenelmis sp.	-				-	-				
COLLEMBOLA			-	-	-		-				
	Isocomurus parustris		-			+		+			
	Sminthurides sp.	-									
DIDIEDA		+					+				
CHONORING			-	-	-			+	+		
	Chironominae						1		+		
	Chiropoguie en			-							
	Cladope(ma										
	Cryptochironomus fulvus		-			-					
	Cryptochironomus sp.	- 	-								
	Dicrotendipes neomodestus	:	-								
	Dicrotendipes nervosus Type 1										
	Dicrotendipes nervosus Type 11										
	Endochironomus sp.										
	Glyptotendipes										
	Harnischia sp.			-							
	Microtendipes	+								-	
	Nilothauma babiyi										
	Parachironomus abortivus	-	-		-	-					
	Paratactornial ta nigrobal teral is	al ic	1	-				† -			
	Paratendipes albimanus		-	-		 					
	Paratendipes nudisquama										
	Phaenopsectra dyair										
	Phaenopsectra flavipes	-	- 	-	-						
	Polypedilum convictum		+	=	-	1	†				
	Polypedium fallax				-		1		1		
	Polypedi (um 1111) noense		+		-	-	•	F	*		
	Desirfoch i rooming co		-	7	=-	,		1			
	Robackia so	:	1		-	-	7			~	
	Stenochironomus sp.		-	 -			1				
	Stictochironomus sp.					-					
	Tribelos sp.										
	Xenochironomus sp.										
	Unidentified chironomini				-		2				-
					:						

TAYA	CEMIE COEPICE	01.31.1	91316	7,6,18	416.10	91210	417.10	\$17.10	0 1/10	31,10	01110
		- (3) (4)		4/6/10	41611	n /c /0	1 2	7 N N	0 2	KILE	K/e/10
	Tanytarsini	-			1	+					
	Cladotanytarsus sp.		-	2	2	-					
	Lauterborniella										
	Micropsectra sp.			-	-						
	Rheotanytarsus sp.	2	2	3	22	-				-	~
	Stempellinella sp										
	Tenytersus coffmani	-									
	Tanytarsus glabrescens				+	!	1				
	lanytarsus quertus	^		+	-	-					
	Onigentified tanytarsini			+	-						
	Drillia Brillia	+	1	+	+						
	Corynomeura celeripes	0		-	-			†	-		
	Corynomeura taris	16		-	=	m					
	Corynoneura sp				-			-			
	Cricotopus bicinctus		-		2	-					
	Cricotopus trifascia								2		
	Cricotopus sp										
	EUKIETTETIB Sp.	 									
	Nenocledius crassicornus	2	-								
	Nanocladius distinctus										
	Nanocladius rectinervis										
	Nenocledius minimus				1						
	Nanocladius sp.			-							-
	Parakiefferiella sp.										7
	Rheocricotopus sp.				-					-	-
	Thieremenniel(a nr. fusca	5		9	٥	7				-	
	Thieremenniella xena	,	1	15	121	7		=			
	Unidentified orthocladinae						2	n			2
	Tanypodinae			1							
	Ablabesmyia mallochi										
	Ablabesmy ia parajanta	-									
	Ablabesmy18 tarella										
	Clinotenypus										
	Labrundinia pilosella		-							-	
	Macropelopia sp.		1								
	Nijotanyak so			,	7	2					
	Pentaneura sp.										
	Procladius sp.										
	Thienemannimyia										
	Unidentified tanypodinae	-									
	Oiemesinae			1							
	Pottnesie	•	1	+	1	+	1	•	•	•	
	Unidentified Chironomidae	5	2	-	2		-	2	F		2
	reratopogonidae	!					1				
	Bezzia so			+							
	Unidentified ceratopopoid										
	Empididae			 	-	†-	+				
	Hemerodromia										
	Tanyderidae			-			٥			3	
	Simuliidae			7		1					
	Simulium sp.		-		33	_	_	_			

TAXA	CERIS COFCIES	R12/1	R1215	21214	2/2/2	81218	D1411	61719	81710	01710	01/2/10
	_		_			-					2 Land
EPHEMEROPTERA				-	-						
	Baetisca sp										
	Caenis sp.	_			<u> </u>	-					
	Ephemerel la sp.					-		-		-	
		-			2	-					
	Tricorythodes sp.					-		-			
	Cinygmula subaequalis										
	Stenocron sp.										
	Stenonema sp.	72		7	9						
	Spinadis wallace	-		2	М						
	Unknown sp. A (squatty bodies)										
	Unknown sp. B (slim guys)			_							
	Unknown sp. C	-									
	Unidentified			-	7			1			
		+	-	-				+			
	Mesovetia	+		-			-			1	
ODONATA		+	-	-	_		-				
	Argia sp.				1	-	+				
	Macromia sp.	+				+					
	Oromogometris so	-			+	+	-				
		 									
PLECOPTERA		-				-	-				
	Perlinella ephyre										
		-	-		_						
	Unidentified	 					m	-	2	-	7
TRICHOPTERA				_			_				
	Ceraclea										
	Macronema zebratum										
	Hydroptile sp.				_						
	Oecetis sp.				27	-				-	
	Chimarra sp.	12		5		9					
	Polycentropus sp.				8		-				
	Lype diversa										
	Unidentified			2						-	
AMPH1P00A		-									
	Symurelle sp.	+									
	Garmarus sp.			+				1			
SOFOOA	Acellie on	1		+	+	-	+				
ACARINA				2	7	-	3	-	-		2
MOLLUSCA			-				-				
PELECYPODA	Corbicula fluminea										
GASTROPODA	Ferrissia rivularis										
	Amnicola sp.	:					-				
	Gyraulus sp.		-			+			+		
933.0	Onidentified	÷-	1	· ·				+	+	+	
MEMATODA		-•	. 00	. ~				7	<u></u>	7	
NEMERTEA			:		! 		. . 				
2000		711	_	- 2	744	127	- 5	- 46	- -	۲	24
DIAL MURBER		2,6	2	7,00	667	Ç.	75	07	9	3:	33
NOTES OF SPECIES		*	0		Q.	0	-	2	٥		

APPENDIX E COUNTS OF MAJOR TAXA, PER CORE SAMPLE, COLLECTED FROM SITE 4 IN THE FALL OF 1989

Table El. Counts of Major Taxa, per Core Sample, Collected From Site 4

in the Fall of 1989

Major Taxa		Riffle Samples								
	1	_3	_4	_6_	_9	_2	<u>_3</u>	<u>_5</u>	_7	9
Oligochaeta	1	4	1	3			1	1		
Chironomidae	15	59	78	100	42	30	19	18	21	13
Ceratopogonidae				1	3					
Coleoptera									1	1
Ephemeroptera		1								
Acarina					2	1				
Nematoda	2		2	2	1					
Nemertea					2					

Table E2. Species Composition of Oligochaetes and Chironomids

Collected From Site 4 in Fall 1989

	Pool Samples					Riffle Samples					
Taxa	_1	_3	_4	_6_	<u> </u>	2	_3	_5	_7	_9	
Oligochaeta											
Naididae											
Dero furcata		1		2							
Pristina leidyi								1			
Specaria josinae		2									
Tubificidae											
Unidentified			1				1				
Chironomidae											
Chironominae											
Chironomus sp.			1								
Dicrotendipes nervosus II			1								
Harnischia sp.											
Phaenopsectra dyari	3	27	38	33	17						
Phaenopsectra flavipes	1	5	10	3	6						
Polypedilum fallax			1								
Polypedilum illinoense		1			1						
Polypedilum nr. scaloneum	11	4	20	8	1 7	8	8	4	6	7	
Robackia sp.						21	9	12	14	6	
Tanytarsini											
Tanytarsus querlus			2	2	1						
Tanypodinae											
Ablabesmyia parajanta		5		1	3						
Procladius sp.			1								
Orthocladinae			_								
Coryoneura celeripes							1		1	1	
Coryoneura taris						1			1	1	
Thienemannimyia sp.			1			_					
Thienemanniella nr. fusca			-		1						